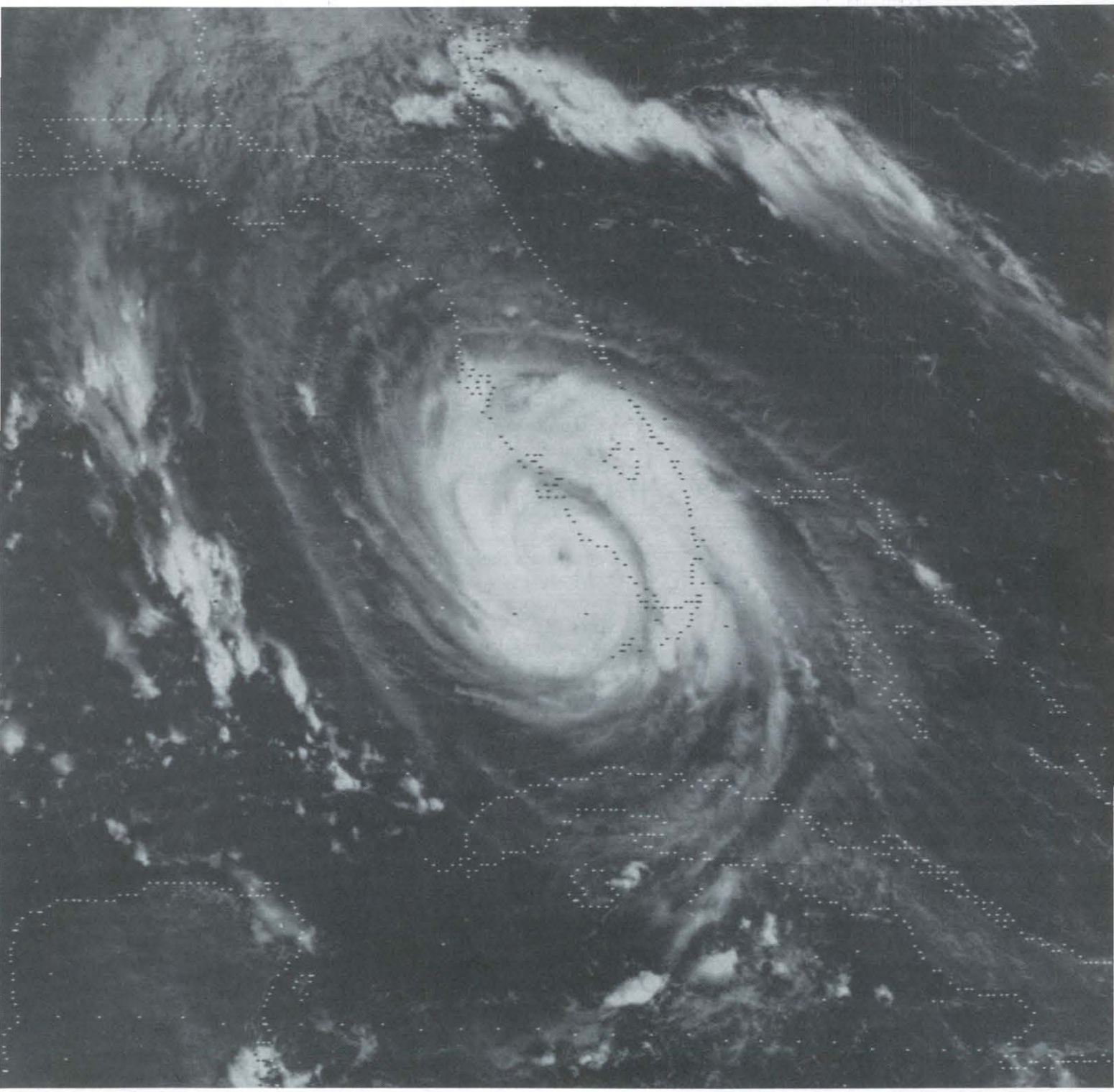
NAVY MEDICINE

September-October 1992



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COVER: Hurricane Andrew, the most destructive storm in U.S. history, sweeps across Florida. Responding to the disaster, DOD mobilized forces from all the services to aid the victims. Story begins on page 1. NOAA satellite photo.

Preventive Medicine in the Wake of Hurricane Andrew

The accommodations are spartan, but the roof is sound and keeps out the steamy, thundering tropical downpours that come and go with the changing sea breezes. Regular meals are assured, too; and so far that promise has been kept, thanks to the Red Cross, other private and governmental relief agencies, and hundreds of thousands, maybe millions, of anonymous helping hands all across America. There is none of the usual griping one often hears when folks are pulled out from behind a desk to do hot, dirty work for long hours far from home. Members of the Navy Preventive Medicine Detachment operating in south Florida after Hurricane Andrew know that just outside the door of the municipal building in which they are billeted are 100 square miles of shattered American communities and a shocked human population still reeling from this country's most destructive storm on record.

Like a 20-mile-wide tornado, this category 5 hurricane ground westward across the southern end of the Florida peninsula on Monday, 24 Aug 1992. The U.S. Hurricane Center, Coral Gables, had a hands-on look at the northern fringe of the main storm when the center's communications, radar tracking system, and weather station were wrecked. Before their anemometer became just another part of the storm's debris, it recorded winds at 164 mph, well above the 75 mph at which humans can no longer stand on two feet.

Damage to the area exceeded all expectations. A handful of small, mixed residential and agricultural communities just don't exist anymore. Perrine, Goulds, Florida City, Homestead, Cutler Ridge, Naranja — some will eventually recover; some may never be rebuilt. Homestead Air Force Base saw every structure destroyed: rumor on day 15 is that it will be

Ron Hall, USAF

Right: **SGT Scott Anderson, stationed at Fort Drum, NY, renails roof shingles on a heavily damaged Homestead, FL, home.** ***Far right:*** **With winds in excess of 160 miles per hour, Hurricane Andrew destroyed or damaged every building at Homestead Air Force Base.** ***Below:*** **An F-4 Phantom aircraft was ripped from its display pedestal.**

SGT Zedrick G. Rockett, USA

Ron Hall, USAF

rebuilt fully, contradicting earlier rumors that it would be left inactive. Rumors are almost as abundant here as mosquitoes.

Electrical power is still out over much of the affected area. Municipal water quality cannot be widely assured, and the systems are being checked southward out of Miami, literally block-by-block, for chlorine content, coliform contamination, salt water intrusion, or other evidence of mechanical damage to the distribution system. The repairs take time and every setback is frustrating. Municipal sewage-pumping and waste-water treatment facilities are still compromised. Homes built to 75-mph wind standards are shattered. Power lines and ancient trees, which at one time clung tenuously to dog-tooth limestone and paper-thin soil, litter the streets, making access to large areas still impractical. The air sings with chainsaw and generator engines, and it looks like the cleanup phase will go on forever.

Emergency preventive medicine considerations are manifested immediately following the impact of an acute disaster such as this, and they continue until municipalities are able to provide full, reliable utilities and services to their populace. Temporary or permanent systems to provide food, potable water, shelter, sanitation, and freedom from the risk of disease must be in place as soon as possible.

Following a request from the United States Public Health Service (USPHS), the Navy Environmental Health Center (NEHC), Norfolk, VA, dispatched an initial preventive medicine assessment team followed by two vector control teams (VCTs), all composed of members of two of NEHC's subordinate commands: Navy Disease Vector Ecology and Control Center, Jacksonville, FL (DVECC JAX), and Navy Environmental Preventive Medicine Unit 2, Norfolk (EPMU-2).

The assessment team consisted of an epidemiologist (CDR Don Herrip), a medical entomologist (LCDR Manuel Lluberas), and two preventive medi-

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cine technicians (HM2 Paul Klimkowski and HM2 Steve Roman). After 2 days on site, the assessment team was augmented by VCT-1 consisting of two medical entomologists (LT Dave Lavender and LTJG Michael Zyzak) and two preventive medicine technicians (HM1 John Roarty and HM1(SW) Dave Wolfert).

Two days after VCT-1 arrived, VCT-2 was deployed, comprised of two additional medical entomologists (LCDR Tom Breaud and LCDR Jim Need) and one additional preventive medicine technician (HM1 Dan Spafford), bringing to 11 the number of Navy preventive medicine specialists assisting directly in relief efforts. The three teams were combined as Navy Preventive Medicine Detachment (PMD). The PMD has been working directly under CAPT Richard Gorham, USPHS, the preventive medicine task force commander. To date, projects have been varied and challenging.

Assessment

The assessment team arrived in the Metro-Dade area on 31 Aug. The team's mission at that point was threefold: to evaluate needs in the storm-stricken area that could be met

SGT Kevin Thomas, USMC

by our resources, to establish points of contact, and to render all necessary assistance to on-site USPHS and local authorities.

Initial evaluation revealed an immediate need for mosquito and fly suppression to reduce the risk of vector-borne diseases. General cleanup, a major concern in vector control, was being addressed by what seemed to be every able-bodied person with no other assignment.

Sanitation at the public works level was being restored, albeit slowly, by local authorities, elements of DOD, and volunteer public works personnel from unaffected municipalities throughout Florida and elsewhere. It was immediately clear that every cupboard, refrigerator, convenience store, *bodega,* supermarket, food warehouse, *carnicería,* and fast-food store was a potential nursery for filth-breeding flies in the absence of refrigeration and organized sanitation.

Filth-breeding flies include the common house fly and the metallic blow flies, the latter of which generally spend their maggot stages in rotting meat. No single person could identify the location of all these breeding sites, so they would be addressed as encountered. Filth flies also breed freely in excrement, so the key to controlling the overall problem would lie in rapid cleanup and the restoration of reliable sanitation.

Additional concern arises from the large, migrant population of farm laborers serving the agricultural industry in Dade County. In other agricultural regions of the United States, cases of malaria transmission have been traced to infected migrant laborers and *normal* sanitation and vector control conditions.

Because many migrant laborers originate in countries where malaria, dengue, and gastrointestinal diseases are found, there is the possibility of transmission of these diseases under the current conditions in south Florida. These and other vector-borne problems pose a very real threat to the exposed human population in the area and enforce the need for thorough disease vector control.

Most residents refuse to leave their homes if the structure provides even the most modest shelter. Shock, fear of looting, and desire to clean up and rebuild keep tens of thousands of people living in wrecked homes that provide no protection from the onslaught of blood-feeding mosquitoes. In the last several years Florida has seen elevated numbers of human cases of both Eastern equine and St. Louis encephalitis, including the two cases in Dade County.

Mosquitoes had taken advantage of the interrupted public health pest control efforts and the all-prevailing debris. The debris collects rainwater in which the mosquitoes spend their immature stages. At the temperatures seen in south Florida in the summer, adult mosquitoes are produced in less than 1 week, and the assessment team was not surprised to find a mosquito problem in full force when they arrived. Several mosquito control districts that were unaffected by the hurricane had already responded with offers of manpower and equipment, especially aerial pesticide application equipment. The U.S. Air Force, responsible for fixed-wing aerial application of pesticides within DOD, had responded as well.

LCDR J.T. Need, MSC

Far left: **In USMC Camp No. 2 Life Support Center, Florida City, a marine talks to a frightened boy and his mother.** *Middle:* **LCDR T.P. Breaud, MSC, and HM1 J.J. Roarty, Jr., inspect the ruins of the commissary convenience store at Homestead AFB for fly breeding sites.** *Below:* **A military general purpose tent serves as a voting station in Redland, FL. South Dade County held elections on 8 Sept despite Hurricane Andrew.**

SGT Zedrick G. Rockett, USA

Operations

The first operational task of PMD was to determine population levels of mosquitoes and pestiferous flies. Nightly mosquito surveillance, using eight carbon dioxide-baited traps placed throughout the area, was initiated immediately. This continuing effort provided the task force with baseline numbers that were used to help evaluate both the threat of mosquito-borne disease and the effectiveness of mosquito control measures. In just *one* night in *one* mosquito trap, over 3,300 female mosquitoes were collected.

Surveillance methods for the immature stages of mosquitoes, conducted to locate breeding sites, included checking swimming pools and hurricane debris filled with water. Surveillance of filth-breeding flies, a daylight task, was less formal. It relied on the experience of the team members to detect breeding sites (or potential breeding sites) for the maggots.

Members of PMD were involved in establishing an epidemiological tracking system for detecting disease outbreaks, supporting U.S. Marine Corps and U.S. Army units in the field with mosquito and fly control, and tracking shipments of insect repellent and rodenticides that had been donated for the hurricane victims' relief. Preventive medicine support was also provided to other services cooperating in the relief efforts.

Liaison was established very early with preventive medicine assets of the U.S. Army and Homestead AFB, and on several occasions trouble calls were referred between DOD services to increase the efficiency of operations. Providing fly control at six Air Force commissary-exchange locations on Homestead AFB proved extremely challenging. These areas had not been refrigerated since the storm struck, and the resulting accumulations of rotting food were ideal for fly breeding. Debris made sanitation impractical as an immediate solution, and there were environmental concerns about applying pesticides to areas that might soon function in food service.

As support efforts transition from immediate relief work to recovery work, and as agencies of Dade County and the State of Florida regain control, Navy preventive medicine assets assigned to Hurricane Andrew assistance will return to their home units. But the memory of the damage and destruction, so close to home, will not soon be forgotten. □

—Story by LT D.R. Lavender, MSC; LCDR J.T. Need, MSC; and A.F. Beck, Ph.D., Navy Disease Vector Ecology and Control Center, Jacksonville, FL 32212-0043.

Surviving Super Typhoon Omar

Tuesday—25 Aug 1992—1200: "It's just a tropical *depression* but will probably reach tropical storm intensity when it passes somewhere near Guam. We will set tropical storm condition III (storm expected within 48 hours but no big deal)."

Wednesday—26 Aug 1992—1500: "Well, it's now a small tropical *storm* and it's tracking toward Guam. Let's check the book and give it a name. Omar, OK? May get some wind and rain from this one. Just a bit. Hey, did you hear about Hurricane Andrew and the southern tip of Florida?"

Thursday—27 Aug 1992—0930: "Seems to be stalled and still a tropical storm. Normally when a storm stalls, it picks up intensity but this one doesn't seem to be doing that (Does it sound like Murphy's Law is about to become operational here?)."

Thursday—27 Aug 1992—1600: "This one is peculiar. Seems to be moving west northwest and tracking right toward Guam. Better set tropical storm condition II (storm with nondestructive winds expected within 24 hours)."

Friday—28 Aug 1992—0349: "CAPT Wilcox, this is the officer of the day and we were notified at 0200 that we have gone into *typhoon condition one* (destructive winds expected within 12 hours)."

Thus began the saga of Super Typhoon Omar. Typhoons are defined by winds of at least 75 miles per hour. A super typhoon is defined as a storm with sustained winds of 150 miles per hour. "Come on Miss Sue, it's time to pack up the fouton, some clothes, snacks and diet coke, and head for the hospital." Over the next 45 minutes we gathered our belongings for what we expected to be a 24-hour stay in my office, packed up the Town Car, and drove the quarter of a mile to the hospital. Once there, the fouton went on the floor and Miss Sue resumed the prone position. I went out to make rounds in the hospital to see how preparations were coming for this impending "mini typhoon." All was going well. We had 65 patients in-house and the intensive care unit (ICU) had two critical patients on ventilators and one accident victim. The emergency backup 1250 KW generator had a full tank of fuel and the 75 KW was also standing at the ready if needed. We had 3 weeks of food in the galley. The key personnel required to be present during

typhoon condition one slowly arrived at the facility and all nonessential personnel went home to batten down the hatches.

0700: All is well. It has started to rain and there are some gusts of wind but this is going to be a cake walk. Maybe Sue can get her book read and I can get some paperwork done.

0900: Pretty boring. This is a typhoon? Really pretty piddly.

1000: Now the rain is heavy and blowing in at 45°. Palm fronds are coming down. The CO and I drive around the complex. The ocean is whipping up a froth but there is no major problem.

1100: Hey! Things have picked up a bit. The rain is heavy and the hospital is starting to leak. Duty crews are dispatched with mops and pails. Island power goes "bye bye" and we are up and operating within 7 seconds on our backup 1250 KW generator.

1300: Wow! This is a bit more than we bargained for. The winds must be 90-100 mph out there, and I just saw a coconut actually fly by my window. One of the trees outside is violently uprooted. We have major flooding coming in around windows and through cracks in the building. The crews can't keep up. I take another drive around the compound in a security van and we are buffeted by winds of over 100 miles per hour. The ocean is furious and the surf can barely be seen through the mist crashing in on the reef. This is pretty impressive. A lot of branches are down. I call a couple of docs who are riding this out at home. Power is gone. Water OK.

1400: Wait until I get my hands on the forecaster. We open a door to test the winds and are immediately blown back into the building. No more of that. I walk through the hospital and on all floors there is as much as 2 inches of water on the decks. Due to safety factors, I recommend suspension of the use of defibrillator paddles if there is a code because the paddle users would be standing in up to 4 inches of water in ICU and could themselves be electrocuted.

1500: Visibility through the windows is only about 150 feet and the rain is horizontal. The winds are probably 125 mph at this point and way above what we had been cautioned to prepare for by our weather guessers. We lose the 1250 KW generator. Now we are left with only a small 75 KW generator and have power to only the ICU, operating room, delivery suite, and emergency. All air conditioning is gone and even though it is only in the low 80's, the humidity becomes oppressive. Walls weep with water; insides of bookcases and pictures are clouded with moisture. There are 2 inches of water on all decks. The stairwells are waterfalls.

1600: Winds now of at least 150 mph with gusts to 180. Hey, top winds in Andrew were 192. There is going to be some major damage here. I look outside and there are a lot of palm trees down as well as other vegetation. A window blows out in the Alcohol Rehab Unit where Sue works. A corpsman's brand new pick up truck is rocketed through the air smashing against the side of a van. A doctor's car is seen rolling over and over down the street as these tremendous winds from the north destroy everything in their path. Another window blows in the corridors. We all start avoiding being near north facing windows. Another van rolls over and over down the street and many cars are pushed together as they dance in the parking lots. The rain is so heavy and the wind so strong that you can't see 100 feet. The metal flag pole whips wildly and we fear that it may topple. Trash dumpsters catapult down the street.

1630: And then the eye! At least the prediction that the typhoon was coming directly at Guam is correct. The eye passes directly over the center of the island and the hospital. There is no wind whatsoever and the dead calm is eerie but neither do I see the sunshine that I have heard about in the eye of a hurricane. We send out a security patrol to assess the damage for the first half of the storm. They come back reporting that there is massive destruction of vegetation. Power lines are down all over and there is structual damage to almost every house. That is the good news. The bad news is that the home that Miss Sue and I left only 12 hours before has lost a portion of the roof and the garage has been virtually destroyed. The freezer is sitting on the Town Car and the dryer has blown into the street. I instantaneously run for an empty security vehicle and drive to the house. It is a disaster. Many of the palm trees are in the road. The Plumeria trees have all been broken off at the ground level. A part of the house roof is 100 yards off to the south. Our beloved banana plantation has been leveled. The washer (located in the garage) has been pulled from its water fittings and is on its side. The two water pipes are ejecting a steady stream of water. The north wall of the garage has disappeared. The 100 square feet of storage space is no more, and there are books, toolboxes, bikes, lawn mowers, golf balls, golf carts, and a million other items all over the yard and neighborhood. Our house has taken the most severe damage by far. It was built in 1945 by Japanese prisoners of war but had withstood Pamela and Karen and Camille, all of which were super typhoons. With dread, I unlock the door. There is a torrent of water that pours like a waterfall out onto the patio. The ceiling in the dining room has collapsed. Water is pouring into the house from the attic. My SCUBA gear is all wet (so what). There is major internal damage to the house. We now have skylights that we didn't order. I know I must do something but I am paralyzed. The winds suddenly pick up. The other

side of Typhoon Omar is arriving and with a vengeance. I run out the door making sure it is locked and start to leap into the truck. I then spy the dryer which has been blown 60 feet into the street by the north winds. With the anticipated southerly winds during the back side of the eye, I take time to roll it into the yard to protect the Town Car. By the time I get the quarter of a mile back to the hospital, the pick up is buffeted by 100 mile-an-hour winds and the rain is horizontal. This is too much even for this Walter Mitty. I dash up the ramp and find that the door has been wedged closed from inside. Fortunately, two corpsmen see my plight and open the door. I'm really getting too old for this stuff. What will happen with chapter two of the typhoon? Will the entire roof on the house go? Birds who had taken shelter on the lee side of the hospital and who were chirping away during the eye are literally blown away as the winds change direction by 180°.

1700: The storm rages and we hold an executive-level meeting. We are faced now with minimal power and if the 75 KW generator goes, we are out of power. In many ways we are practicing 1930's medicine already. The two patients on ventilators will have to be breathed by hand if we lose the "75" generator.

1800: Darkness descends. I now trek through a pitch black hospital aided by a flashlight. I am walking in 2-3 inches of water. Water pours through broken windows and structural defects. The stairwells are waterfalls. The winds rage and more rain comes. Everyone who can be spared is bailing water or manning a mop.

1900: The winds start to let up a bit. Is it possible that this is the beginning of the end. One of the patients in ICU expires. In pitch black, I escort four corpsmen as they carry the body down two flights of stairs on a stretcher. It is treacherous because of the waterfalls in the stairwell. Our only illumination comes from lanterns but we get to the morgue safely.

2000: What is this? The winds are picking up again? Seven years ago, a typhoon stalled just after passing Guam and then circled back. Can this be happening again. The "75" is holding its own. But with the limited electricity, we are now in danger of losing our frozen food and many of our pharmaceuticals. The electricians are trying to work on the problem even as the storm rages.

2200: The winds are now definitely dying down. Can't be more than 60 mph at this point. Maybe we will survive.

2400: I make complete rounds of all areas of the hospital one final time in the darkness. All is quiet. No patients come in because it is impossible for them to get here or for our ambulances to go get them. Those wards with minimal electricity are doing OK. It is very humid and the walls are sweating. The floors are covered with water. There are braces holding plywood in place where once there were windows. The staff show signs of major fatigue. Little wonder! They have worked continually now for over 24 hours and adding the stress of the storm and questions of family members riding it out at home, there is growing anxiety. I join Sue on the double fouton but am too exhausted to sleep in the oppressive humidity. I am up and down during the night taking reports which indicate we are holding our own and that the storm is finally abating.

Saturday—26 Aug 1992—0600: I awake to a dawn of leaden skies and continued rain. The winds are blustery but not destructive. We have survived Super Typhoon Omar. I make rounds and go to a couple of damage control meetings where we get things organized. I finally get away from the hospital to recheck the house. There is massive destruction. The BOQ has windows blown out everywhere. The row of beautiful palm trees in front of the hospital is laying in the street. Coconuts are everywhere. I arrive at home. The dryer is no where to be seen. Has it blown over the cliff or been looted? The garage is a disaster. The breezeway is a mass of splintered timber. There is a gaping hole in the roof. Amazingly, no more ceiling has come down and the back bedrooms are dry (but terribly humid). Miss Sue is not going to be happy. Neither am I. But, the important thing is that we have come through this storm without physical injury. I never want to see another typhoon in my life. This one is enough. The final analysis will show that there was no loss of life or even a major injury in the military community. We are grateful for that.

Sunday—30 Aug 1992—1000: I am stuck at the hospital. Miss Sue has gone to the house with a couple of friends but they come back without her. The grief and loss cycle has begun. At the house, I take a *cold* shower. There is only a trickle of water and with this body, it takes a long time to rinse. But my how refreshing.

Monday—31 Aug 1992—2300: Very busy times. The hospital struggles to provide basic services. SPRINT (Special Psychiatric Rapid Intervention Team) arrives from San Diego.

Wednesday—2 Sept 1992—2300: The skies are clear and it promises to be hot. We have island power back from GPA sources but we lose it during the evening and go back on our generator. SPRINT is training personnel including Sue to go into the community to assist with the psychological fallout in the aftermath of the disaster. I spend 2 hours on the steam line serving food to 300 hospital personnel and it is time well spent. Sue spends the afternoon at home sweeping water out the door. We pray that the tarp on the roof will hold out major new accumulations of water. There is mold and mildew on the ceilings (those that are remaining). The environmental health people come at my

request to test the ceiling for asbestos content. We continue to live in my office. I work while Sue, Fran, and Angie (CO's wife and daughter) play Trivial Pursuit on the floor. We now enter a dangerous phase. The *shock* of the storm is subsiding; reality is setting in. The total "can do" approach is evaporating and we are entering the *anger* phase. We close the BEQ and BOQ because they are not habitable and move the residents into the hospital. At a 2100 meeting, the anger becomes evident. Why are the Seabees being sent out into the Chamorro communities when the Navy areas are still a disaster? Why don't officers have to be in work parties? What about being able to wash clothes? Why doesn't the Navy send dependents and nonessential personnel home in light of the fact that there may be no power to homes for as long as 2 months? Concern about major issues that existed prior to OMAR spill out. The CO and I listen as the anger crescendos. We, as the leadership, have our jobs cut out for us. It may be difficult to hold this all together. SPRINT will help. *And what was that?* Did I see the wall move? And then we feel it! A 15-second earthquake gets our attention. God, haven't we had enough?

Thursday—3 Sept 1992—2345: We continue to rework the hospital. Sue is at Andersen with SPRINT. I finally get the courage to go to the house to shovel out the collapsed ceiling and insulation which is soaking up water. Even though there is a tarp on the roof, we have reaccumulated an inch of water. Two sailors from USS *Holland* arrive with a van, and I decide to get my audiovisual system to the hospital fearing the worst. We struggle to lift it into the van without taking it out of the racks. Really heavy. Set up in the hospital, I decide to fire it up and to my joy, all units are working. We put it in a large conference room and will use it to show movies for the staff.

Friday—4 Sept 1992—1415: One week ago today, at this exact time, we were in the middle of a maelstrom. The incredible events of the past week and the aftermath are leaving indelible impressions on everyone who went through the experience. Sue and I are both experiencing anger when we learn that the Navy will only pay for the depreciated cost of goods destroyed during the typhoon. USAA may do us better. We are a bit edgy with each other and could be taking better care of ourselves. It is interesting to be intellectually aware of what is happening psychologically and not be able to use that awareness to prevent the emotional cycles. Friends help! Some dependents are so stressed that they buy their own airline tickets and fly off the island. John Casey, one of my very close golfing buddies who left the island a month ago, calls from Philadelphia and we talk of all the trees that were on the course that are now gone. He tells us that the Guam Grapevine is reporting that our home was blown over the cliff and on top of the Jungle Club. No such luck. They were closed the night of the typhoon but have been putting out 180 DB music since then.

Saturday—5 Sept 1992—2200: I finally get an afternoon to go to the house. The Seabees and PWC are there starting to clear debris. In the evening, Sue and I get off the hospital compound for the first time in 10 days. A meal at Sizzler hits the spot, but the Frosty machine at Wendy's is broken. Rumors that our dryer had been seen floating by Rota (an island 40 miles north) are dispelled when we return to my office. The door of the dryer with some of our clothes has been placed against my desk. Two of our physician's assistants, one of whom was a SEAL, have followed up on a reported sighting of the dryer half way down the cliff and rappelled down to confirm returning with hard evidence. Comic relief in spades!!

Sunday—6 Sept 1992—Noon: Happy Birthday Miss Sue!! I serve her coffee on the fouton on the office floor. Fearing that I would forget her birthday, she had gone to the typhoon sale at the Bazaar yesterday and selected three pieces of antique Korean furniture. Therapeutic for her. (And no, I did not forget her birthday!!!).Things are starting to normalize as we have some homes on the compound with island power. For Sue and me, it will be some time until we are business as usual. It may take 2 months to get our house repaired. But we are OK and we have persevered. Think of the stories we will have to tell our grandchildren, some of which we have not even made up yet.□

—Story by CAPT Martin W. Wilcox, MC. Executive Officer, Naval Hospital, Guam.

Correction

In the July-August 1992 issue of *Navy Medicine*, the article "The Personality Disorder Patient in the Military Mental Health Clinic" incorrectly listed the authors' affiliations. CDR Raczek is a staff psychiatrist, Naval Hospital, San Diego, CA 92134-5000. LCDR Patten is a clinical psychologist, Naval Hospital, Naples, Italy.

Recent Advances in Navy Clinical Psychology

CAPT Frank A. Mullins, MSC, USN

The development of American clinical psychology in the Navy from 1900 to 1988 was chronicled by McGuire.(*1*) Emerging issues for clinical psychologists in the Navy, based upon community experiences from the 5 preceding years, were outlined by the present author (*2*) just 6 weeks before the Persian Gulf crisis.

The most recent history of Navy clinical psychology has been marked by achievement of new milestones in professional training and support of combat personnel under contingency operations. In recognition of the more unique aspects of psychological practice within the military environment, Congress authorized the development of two new training programs for Department of Defense (DOD) psychologists; a doctoral training program at the Uniformed Services University of the Health Sciences (USUHS), Bethesda, MD, and an experimental psychotropic medications fellowship at USUHS and Walter Reed Army Medical Center, Washington, DC. The Navy is participating in both these new opportunities for clinical psychologists to facilitate military medicine.

Equally important, in November 1991, Navy hospitals at Portsmouth, VA, and San Diego, CA, graduated their first class of interns, bringing the total number of Navy clinical psychology internship sites to three. The interns from *both* commands graduated from programs that received *full accreditation* from the American Psychological Association the *first* year of operation, an extremely rare occurrence in the history of psychology accreditation.

Lastly, these events occurred within the context of the largest deployment of Navy clinical psychologists since World War II in support of Operations Desert Shield/Storm, which tested community readiness for contingency operations. The implications for the community and collective lessons learned by deployed psychologists are discussed elsewhere.(*3-5*)

Background

American psychology has traditionally enjoyed an excellent relationship with the military. World War I cemented the science of psychology into the national fabric by using psychological tests and techniques to select, train, and develop technical and professional skills for the first modern mechanized American force.(*6,7*) World War II provided the stimulus leading to the "flowering" of the professional practice of psychology on a national basis.(*8,9*) The demand for psychological services to deal with human problems continues to grow within the military and society at large as the nation evolves.

Although the Navy, like its sister services, has become progressively more reliant upon intern accessions from civilian university training programs to meet the increased demand for psychological services within the military, it was the special aspects of military clinical psychology practice, more than the volume of practitioners needed, that

prompted Congress to authorize establishment of the doctoral training program and fellowship.

The doctoral training program would be unable to produce enough students for all DOD internships, just as the medical school cannot produce enough physicians for military medicine, but the specialized dimensions of military practice would be highlighted by the existence of a program for clinical psychologists just as they are for military physicians. Similarly, although the experimental program for training psychologists in the practice of psychopharmacology has sparked a lively debate in both psychological and medical circles, it nevertheless brings home the point that military clinical psychologists need training that civilian psychology training institutions do not currently provide, and the basis for *all* military-sponsored training is for contingency operations.

The genesis for expanding internship sites took place on 18 July 1985 when DOD Directive 6025.6 was signed mandating licensure for all physicians, dentists, nurses, and clinical psychologists. Since the early 1950's the original internship at Bethesda, MD, had been the major accession tool for both reserve and career-designated clinical psychologists; however, it could not produce enough trainees to keep billets filled as demands for psychological services increased rapidly the last two decades, and as scope of practice and incentive systems for psychologists continued to improve in the civilian sector.

The advent of required licensure demonstrated to the Navy that direct accession of licensed psychologists for active duty within the constraints of the Defense Officer Personnel Management Act of 1981 was not viable. The incentive system for interns, however, remained more than competitive; and history had demonstrated that military mental health, with its greater administrative overlay and higher accountability than civilian practice, benefited by having providers receive training in the environment in which they would provide services. The creation of additional internships became the solution of choice. By locating new internships in Portsmouth and San Diego, making the training even *more* relevant for service to the fleet became possible.

The decision to triple internships was made by the Surgeon General in 1988, and a plan-of-action and milestones (POA&M) was generated at BUMED (Bureau of Medicine and Surgery) to establish these training programs. To enhance recruitment, it was planned additionally to have both new programs accredited by the time the first classes graduated in November 1991. It was acknowledged this would be difficult as accreditation by psychology training programs is usually sought the second or third year, and provisional accreditation is a more typical first award in the civilian sector. Thus, application for examination immediately after start-up would not be expected by the Accreditation Committee of the American Psychological Association. However, the original program at Bethesda had been continuously accredited since 1964, and it had been called a "model program" because it matched training goals to known postinternship service requirements. It also employed a mixed military and civilian staff with a civilian training director to maximize continuity of training, one of the areas of concern intermittently expressed over the years by the American Psychological Association toward military internships.(*10,11*)

The Bethesda model was applied to the new sites with appropriate modifications being made to take advantage of the strengths the hospitals would have in locations with the largest concentrations of operational units. New clinical departments of psychology were established to house the internships. A senior civilian clinician with extensive internship training experience was hired at each new site to assist the department head in meeting civilian accreditation criteria. A national director was authorized to monitor curricula, interface with external agencies, and work closely with Navy and civilian organizations in such vital processes as advertising, recruiting, and selection.

The strength of the Navy's planning was immediately validated when credentialed staff from all three internship sites were deployed suddenly to Operations Desert Shield/Storm, starting in August 1990, with backfill by reservists. The first classes at the new sites started in November with a number of newly assigned teaching staff. Preaccreditation site visits by senior consultants were conducted during the spring, followed by applications and formal accreditation visits by examiners from the American Psychological Association in early summer. Less than 2 weeks after graduation of the first classes in November 1991, the Accreditation Committee formally awarded full accreditation to both new programs retroactive to the date of the site visits.

New Clinical Psychology Developmental Periods

These recent developments are part of a larger historical process of clinical psychology in the military. Just as American psychology has become a more important participant in civilian health care, military clinical psychology has been progressively rewarded for its contributions to military medicine through the provision of effective services. And its mission continues to grow.

Within the Navy, the developmental periods of professional growth of clinical psychology, based upon increasing scopes of practice and responsibility for health care provision and management, may be divided roughly by decades.(*12*)

World War II was the occasion for the first uniformed psychologists in the Navy. The 1940's and 1950's constituted the initial, or *Preprofessional Period,* as the work performed was quite varied, not well defined, and typically not mandated by higher authority. The absence of a clear-cut mission, other than the expectation that psychologists use psychological tests, led to the evolution of a "lone ranger" model wherein individual psychologists provided

situation-specific services that were required to get the job asked of them done. McGuire's (*1*) account of this historical process is highly recommended for the interested reader. Work centered on manpower management research, analyses of systems, and some clinical work. There was no clear distinction between clinical practice and applied research in the psychologist's role in Navy medicine.

The 1960's produced the *Paraprofessional Period.* During this decade Navy clinical psychologists moved largely into clinical work. Entry into the community required a minimum of the master's degree. In 1967 clinicians began working independently in line commands providing both clinical treatment and consultation in facilitating organizational effectiveness.

The 1970's witnessed the emergence of the *Professional Period.* This decade was marked by a large increase in mental health care volume, primarily in the ambulatory care division of psychiatry departments, as billets increased rapidly the second half of the decade. Professional requirements were formally increased to the doctorate degree in 1977. Navy clinical psychologists developed clinical management skills as outpatient division heads of psychiatry departments, as this was an excellent division of mental health providers' labor at that time. "Psychology" departments evolved at small hospitals without a psychiatrist to fill the mental health function of the command; however, this was not recognized officially beyond the command level.

During the 1980's Navy clinical psychologists entered a *Parity Period* in mental health issues. The community experienced a constant billet authorization accompanied by continued increases in scope of practice in patient care. This general trend was accompanied by more responsibilities for management of clinical services. Psychologists became mental health alternatives in the system. They remained most heavily involved in ambulatory care divisions, although a small number of inpatient alcohol rehabilitation departments (ARDs) in hospitals had been headed by psychologists since the previous decade. Several of the more experienced psychologists were called upon to act unofficially as the head of a psychiatry department, and the community added its first clinical department of psychology in a major teaching hospital in 1987 at Bethesda.

The decision was made in 1988 to triple the internships due to difficulties inherent with licensure requirements, as noted earlier. The number of psychology departments tripled in that process by 1990 while the Navy streamlined the mental health function of all other hospitals into the mental health department model in 1989. By the end of the decade, junior psychologists entering the Navy could look forward to practicing across three clinical paths while remaining competitive for 0-6; heading small to large ARDs, mental health departments, and psychology departments with training programs.

Clinical psychologists were also rewarded with two new subspecialty codes, bringing the total to four, and they could compete for a very small number of clinical management billets within the health care service delivery structure in the Navy and DOD. By decade's end the breadth of services in Navy medicine provided by clinical psychologists included general, child, neuropsychology, and medical psychology. All but general services required formal fellowship training prior to awarding of the additional subspecialty code. The billet structure of the community was altered to accommodate these increases in practice and managerial responsibilities.

The current decade is becoming known as the *Professional Psychology Period.* It has been marked by further development of psychological services models, continued movement into new environments more closely related to mission, and continued pressure from within the system to move the community into broader areas of clinical managerial responsibilities. Although a good start had been made before the Persian Gulf crisis erupted, the past performance of the community, deployment successes, lessons learned, and new training opportunities will assist the clinical psychology community in meeting its obligations to Navy medicine as its mission continues to evolve.

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AIDS-Related Knowledge, Attitudes, and Behavior Among Navy Personnel

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By October 1991, the total number of AIDS cases in the United States approached 200,000. That number is projected to reach 365,000 by the end of 1992.(*1*) Although involvement in the military self-selects against the highest risk behaviors for disease caused by the human immunodeficiency virus (HIV), transmission of the virus continues to occur within its ranks. As of 1 June 1991, 3,900 HIV-positive active duty Navy and Marine Corps personnel have been identified since the military began testing in 1986.(*2*)

Of the 1,070,511 Navy and Marine Corps personnel tested for HIV from 1986 through 1988, 582 were found to convert from a negative to a positive status.(*3*) Similarly, the U.S. Army tested 718,780 soldiers from 1985 through 1988 and found 429 seroconversions.(*4*) Clearly, individuals in the military are not immune from this disease. And although the overall number of HIV cases in the military are relatively few, with progression of virtually all HIV-infected persons to AIDS and the associated morbidity, mortality, and health care costs, this is a significant issue for the military medical department. Navy medicine must take a proactive role in combating HIV disease in sailors and marines. Prevention is the goal; education is our only tool.

In an effort to evaluate educational needs related to AIDS, we conducted a survey of active duty Navy personnel at Pearl Harbor, HI, in November and December 1990. Our goal was to assess the current status of understanding of transmission and prevention, self-perceived needs and high-risk behavior related to AIDS so as to better focus educational efforts. In addition to surveying Navy personnel in general, we also wanted to look specifically at two groups known to be at increased risk of HIV infection in the general U.S. population—racial minorities and women.

Methods

A self-administered, anonymous, 29-question survey was administered to 500 personnel from two shore-based commands at Pearl Harbor. The commands were chosen because they were well represented by women and minorities. The questionnaire addressed the following issues: knowledge of HIV transmission (seven questions), personal sexual behaviors (six), attitudes about and use of condoms (four), opinions of previously received training (four), and attitudes about HIV education in mixed (male, female) audiences (three). There were also five demographic questions. The data was analyzed with the statistical program Epi Info, Version 5. All p values presented in the text are standard 2 x 2 chi-square derivations, unless otherwise specified.

Results

Demographics. Although the questionnaire was anonymous, many of the 500 people who completed the survey did not provide some or all of the demographic informa-

tion, ranging from 26 who would not report age to 109 who would not report marital status. Of those who listed their sex, 361 (80 percent) were males and 92 females. For race, 290 (60 percent) were white, 62 (14 percent) black, 22 (5 percent) Hispanic, 55 (12 percent) Asian/Pacific Islander, and 13 (3 percent) others. Sixty-six percent of respondents were under age 30 and 50 percent were married.

Attitudes Concerning Training. Ninety-two percent indicated they had received at least 1 hour of AIDS training in the previous year; 59 percent by way of the video "A Soldier's Story," 18 percent by medical briefing, and 23 percent by other means. Overall, 80 percent felt the training was "good and they learned a great deal about AIDS and how it is spread," while 20 percent felt the training was "poor or too technical." Respondents were equally satisfied with the video or the medical briefing, with 80 percent and 83 percent, respectively, stating the training was good.

Although respondents were in general satisfied with the training they had received, 33 percent stated they felt they needed "a little more" information and 27 percent said they needed "a lot more." Blacks were significantly more likely to desire "a lot more" information when compared to whites, 41 percent vs. 27 percent (p=.025), respectively, and to other minorities, 41 percent vs. 22 percent (p=.016).

Knowledge of HIV Transmission. Ninety-five percent of respondents answered yes to the question "Do you understand how AIDS is transmitted and what you can do to avoid it." There was no significant association for sex, race, or age for the 23 persons who said they did not understand.

Respondents were very knowledgeable about the ways in which HIV is and is not transmitted. For exposures associated with transmission, 99 percent knew HIV could be transmitted sexually, 97 percent by using IV drugs, 95 percent by receiving blood transfusions, and 92 percent from mother to child during pregnancy. For exposures not associated with transmission, 91 percent answered correctly that HIV is not spread by drinking after an infected person and 97 percent by working in the same office with an infected person. Table 1 shows correct responses by race and sex. Those who previously stated they needed more information were no more likely to answer questions concerning HIV transmission incorrectly than were persons who said they did not need more information.

Although virtually all respondents knew that HIV could

TABLE 1
Percentage of Sailors Reponding Correctly to Questions Measuring Knowledge of HIV Transmission, Pearl Harbor, HI, 1990

	Correctly Identified as Risk Factor for HIV (%)				Correctly Identified as Nonrisk Factor for HIV (%)	
Race/Sex	Sexually	Receiving blood transfusion	Using IV drugs	During pregnancy	Drinking after infected person	Working with infected person
White						
Male (N=227)	100	94	99	93	94	100
Female (N=54)	100	100	100	100	96	100
Black						
Male (N=39)	100	97	95	87	85	100
Female (N=23)	100	91	96	83	100	100
Hispanic						
Male (N=16)	94	94	94	88	94	100
Female (N=4)	100	100	100	100	100	75
Asian/Pacific Islander						
Male (N=47)	100	100	98	91	85	91
Female (N=6)	100	100	100	100	67	100
Others						
Male (N=11)	100	100	100	82	91	91
Female (None)						

be transmitted sexually, 22 people (17 males, 2 females, 3 unknown) felt it could only be spread by homosexual contacts. Minority males were significantly more likely to hold this view than white males (black, p=.009; Hispanic, p=.04; Asian/Pacific Islander, p=.001; Fisher exact, 2-tailed).

Seventy-two persons (14.4 percent) did not think a person with only a positive HIV test could potentially spread the disease to others. Although this belief was not associated with race or sex, it was associated with age, with 17- to 24-year-olds more likely to have this misconception than those 25 and above, 20 percent vs. 11 percent (p=.014), respectively.

Seven percent of respondents (25 males and 6 females) did not believe that having sex with a prostitute increased the risk of contracting HIV. Minorities, as compared to whites, were more likely to think that sex with prostitutes was not risky, 5 percent vs. 11 percent (p=.047), respectively.

Eight percent of respondents (26 males, 10 females) disagreed that using condoms would decrease the risk of contracting HIV. Persons 25 years and older were more likely to take this view (p=.022). In particular, women over the age of 25 were more likely than younger women and men their own age to disagree that condoms decreased the risk of HIV (p=.013, p=.035, respectively, Fisher exact, 2-tailed).

High-Risk Behavior. Thirty-seven percent of respondents reported more than one sexual partner in the last year. Fourteen percent of all respondents and 37 percent of those reporting more than one partner in the last year reported four or more. Having more than one partner was not associated with sex or race but was associated with age. Seventeen to 24-year-olds were more likely to report multiple partners than those older (p=.047). Although having more than one sexual partner was not associated with race, having four or more was. Blacks and Hispanics were more likely to have had four or more partners in the last year than were whites (p=.013, p=.04, respectively, Fisher exact, 2-tailed).

Forty-one percent of respondents reported ever having had sex with a prostitute. Whites were significantly more likely to have had sex with a prostitute when compared to blacks (p=.006) and when compared to all minorities (p=.01). Twenty-nine percent of all respondents reported ever having had a sexually transmitted disease (STD).

Changes in Behavior Due to AIDS. Sixty-two percent stated they had changed their sexual behavior because of AIDS. There was no difference between sexes or age groups. Interestingly, married people were just as likely to have changed their behavior as were singles. Significant differences for this question existed between races. Seventy-seven percent of blacks and 82 percent of all minorities indicated they had changed their behavior compared to 57 percent of the whites (p=.01, p=.0004, respectively). Minority males and females indicated similar changes in behavior. Persons who indicated they did not understand how AIDS was transmitted and what to do to avoid it on an earlier question were just as likely to say they changed their behavior as those who claimed they did understand.

Similar findings were seen for the question "I would be more inclined to use a condom now than in past years." Although no differences were seen for sex or age, blacks were significantly more likely (81 percent) to answer yes to this question than were whites (69 percent) (p=.005). Respondents who reported three or more sexual contacts in the last year were no more likely to respond yes to this question than were people with only one or two contacts.

Attitudes About and Use of Condoms. Forty-nine percent of repondents said that condoms were awkward to use and 51 percent said they decrease sexual pleasure. These respondents showed no significant differences as to sex, race, age, or marital status. This attitude does not mean these people never use condoms, however, as those who felt this were just as likely to report they were more inclined to use condoms now than in the past as were people who did not have this attitude. They were also no more likely to report having had an STD than were others.

Seventy-three percent of persons said they had never used a condom and at present 13 percent always use them, 14 percent use them more than half the time, 33 percent less than half the time, and 38 percent never. No differences were noted between sexes or races for frequency of condom use. For age, 17- to 20-year-olds were less likely to report never using condoms and more likely to report using them at least half the time than were older groups.

Persons having more than one sexual contact in the last year were significantly more likely than persons having only one contact to report using condoms at least half the time. Thirty-five percent of persons who reported more than one sexual contact said they use condoms one-half the time or more, compared to 22 percent who said they had not had more than one contact in the last year (p=.003).

An alarming finding was seen for the 68 persons reporting four or more sexual contacts in the last year. Twenty-five percent said they never use condoms and an additional 42 percent use them less than half the time. Table 2 shows the breakdown of this high-risk group by race and sex. Blacks and Hispanics were significantly more likely to report such practices than were whites (p=.025, p=.01, respectively). The highest rates of this risky behavior (in groups for which a significant sample exists) were seen in black women and Hispanic males.

Attitudes Concerning Sexually-Oriented Discussions. Twenty-three percent of respondents said they would not ask questions of a sexual nature in a mixed (male, female) audience. Men were just as likely to feel this way as were women. Differences were noted between races, however. Twenty-six percent of whites said they would not ask such questions in a mixed audience compared to only 13 percent of blacks (p=.036). Whites were also less likely to ask

questions when compared to all minorities, 26 percent vs. 16 percent (p=.021), respectively. Another significant difference was seen for age. Thirty-two percent of 17- to 20-year-olds said they wouldn't ask these questions compared to only 16 percent of those 35 and over (p=.023).

When asked if they would prefer AIDS training classes attended only by persons of the same sex as themselves, 17 percent of all respondents said yes. Women were more likely than men to want same sex classes, 25 percent vs. 16 percent (p=.045), respectively, even though on the previous question they were similar to men in their willingness to ask sexually-oriented questions. No difference was noted between races or age groups for this question.

Sixteen percent of respondents said they often do not understand the terms used in lectures to describe sexual activities. Men were more likely to state this than were women, with 18 percent of men saying they often don't understand the terms compared to only 9 percent of the women (p=.034). For race, this attitude was held by 14 percent of whites, 23 percent of blacks, 24 percent of Hispanics, and 20 percent Asian/Pacific Islanders. No difference was noted between age groups.

Those who didn't understand sexual terms were more likely to desire more information than others. Seventy-three percent of such repondents indicated they desired a little or a lot more information on AIDS, compared to 60 percent of the people who said they did understand the sexual terms used in lectures (p=.033).

Discussion

The Navy Medical Department must not become complacent in regards to HIV/AIDS education. The numbers clearly show that Navy personnel are at risk for this disease. Moreover, interest in the fleet is high. Sixty percent of the personnel surveyed indicated they wanted more information. HIV/AIDS training must continue to receive emphasis. There are several things to be learned from this survey to help us in that effort.

Level of Knowledge. Overall, the level of knowledge concerning HIV transmission is high. The vast majority of respondents were very knowledgeable about the ways HIV is and is not transmitted, with correct answers for the various categories ranging from 91 to 99 percent. However, there is a minority of persons with some noteworthy misunderstandings: (1) 14 percent felt the disease could not be transmitted by a person with a positive HIV test who was asymptomatic, (2) 4 percent felt it could only be transmitted sexually by homosexual contacts, (3) 7 percent did not believe sex with a prostitute increased risk, and (4) 8 percent did not believe using a condom during sex decreased risk. Although relatively few answered the above questions incorrectly, these misconceptions may potentially lead to transmission, and these points should be stressed during training. The importance becomes more evident when considering reported sexual behaviors: 14 percent reported four or more sexual partners in the last year (and 25 percent of these never use a condom) and 41 percent reported ever having had sex with a prostitute.

AIDS and Minorities. Minorities in the general U.S. population and in the military have an increased likelihood of HIV infection when compared to whites. The ratio of AIDS case incidence in the United States is 3.2 to 1 for blacks and 2.8 to 1 for Hispanics compared to whites.(*1*) In the Navy and Marine Corps, blacks have a 3.7 greater incidence of HIV disease than do whites.(*3*) Factors other than IV drug use appear to be involved as the higher risk persists after controlling for this factor. Some areas of concern regarding minorities were noted during this survey: (1) minority males were significantly more likely than whites to believe that HIV could be transmitted sexually only by homosexual contact, (2) minorities were more likely than whites to think that sex with a prostitute did not increase risk, (3) blacks and Hispanics were more likely than whites to have had four or more sexual partners in the last year and to report that they use condoms never or less than half the time, (4) the only females who did not think that HIV could be transmitted from mother to child during pregnancy were black (4 of 23 black females answered

TABLE 2
Navy Personnel Reporting High-Risk Sexual Behavior,* Pearl Harbor, HI, 1990

Race/Sex	Number (%)
White	
Male (N=227)	17 (7.5)
Female (N=54)	4 (7.4)
Black	
Male (N=39)	4 (10)
Female (N=23)	6 (26)
Hispanic	
Male (N=16)	4 (25)
Female (N=4)	1 (25)
Asian/Pacific Islander	
Male (N=47)	3 (6.4)
Female (N=6)	0
Other	
Male (N=11)	1 (9)
Female (None)	
Total	40**

*Four or more sexual contacts in last year and using condoms never or less than half the time.
**An additional six persons in this category did not list sex or race.

incorrectly), and (5) blacks were more likely to feel they needed "a lot more" AIDS information than were whites and other minorities.

AIDS and Women. AIDS cases in women in the United States have been steadily increasing and women account for an increasing proportion of all cases. The disproportionate burden of HIV disease seen in minorities is even more pronounced among women. In 1988, the death rate from HIV infection was nine times higher for black than white women.(5) Since HIV is believed to be more readily transmitted heterosexually from man to woman than from woman to man, a woman is at increased risk to contract the disease from her infected or high-risk male sexual partner, even though the woman herself may not participate in any of the recognized high-risk behaviors. This means women must be especially careful about knowing the HIV status and sexual behaviors of the men they have sex with, and should insist upon the use of condoms when having sex with anyone they are unsure of. The tragedy of HIV disease in women is compounded in that the majority of these women are of childbearing age and may unknowingly pass the infection to their child if they become pregnant. The above points should be stressed to women during training. The only significant finding in our survey regarding women (except those mentioned above for minorities) was that those over 25 years of age were less likely than younger women and males their own age to believe that condoms decreased the risk of HIV infection.

Age-Specific Concerns. Significant findings for age groups included: (1) 17- to 24-year-olds were more likely than older groups to report multiple sexual partners and to believe that an HIV-positive person who was asymptomatic could not transmit the virus to others, (2) persons over 25 were less likely than those younger to believe that condoms decreased the risk of HIV infection.

Condom Promotion. One-half of the respondents feel that condoms are awkward to use and decrease sexual pleasure. This attitude will obviously decrease the likelihood of persons using condoms. While it is unlikely that education will change this attitude, emphasis should be placed on their role in protection from HIV.

Know the Needs of the Audience. For any education to be effective it must be tailored to the audience. For HIV, this means not only keeping medical terms to a minimum and sometimes talking at the "street level" in regard to sexual terms, but also being aware of the social and cultural attitudes and concerns of subsets of the population, such as minorities and women. Failure to do so may result in the audience not understanding which behaviors put them at risk of infection and which behaviors can protect them. Twenty-five percent of women in this survey said they would prefer classes attended only by women (although not asked, they probably would prefer a female instructor also). This finding should be kept in mind and employed if needed and practicable within your command. This concept may also apply to minorities. If such education is not feasible, the instructor should at the least keep in mind the concerns of these groups and attempt to address them.

Until vaccines or curative drugs are available, which are likely years away, the only defense against HIV infection is prevention from exposure. Although it is the responsibility of every individual to make the appropriate behavioral choices which decrease their risk of exposure, it is up to knowledgeable health care professionals to make sure they have the most current and accurate information available to guide them in those decisions. Health education is nothing new to the Navy Medical Department—we've been giving STD and other health-related lectures for decades. But for HIV disease our educational instrument must be particularly sharp. For HIV, giving out wrong information, or failure to make all the needed information available, may put someone at risk for this fatal disease. Navy medicine must strive to provide effective HIV/AIDS education to Navy personnel on an ongoing basis. We hope the information provided here will assist you in those efforts.

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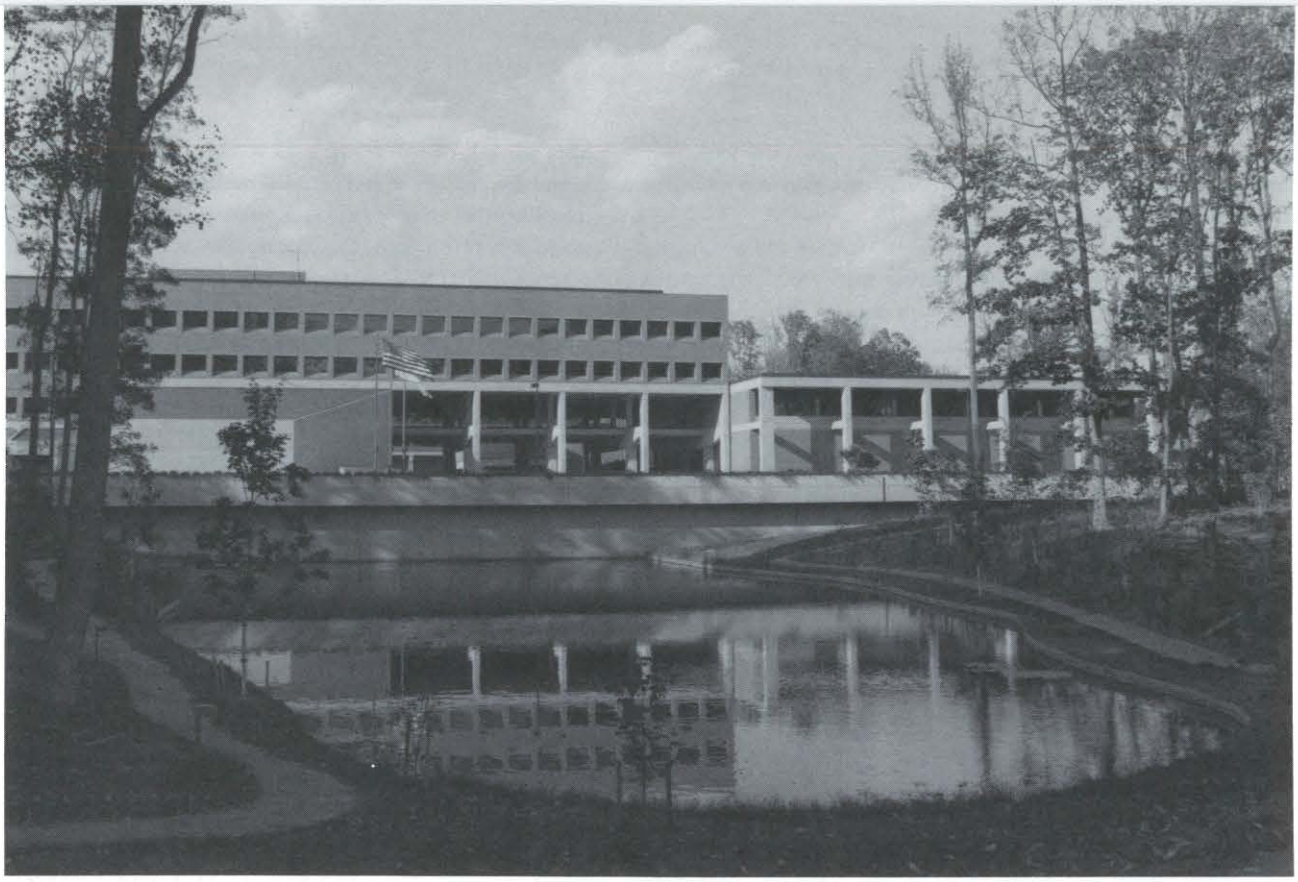


USUHS: It's Not Just a Medical School

Susan D. Straight

The Uniformed Services University of the Health Sciences (USUHS) is one of the military's best-kept secrets. Nestled on scenic grounds behind the National Naval Medical Center, it provides a complete medical education as well as training its graduates for a military career.

USUHS is hardly an easily remembered name, which may account for its virtual anonymity and its seemingly top-secret status even within the military; not even all Medical Corps personnel are aware of its existence.

The school was chartered in 1972 in response to a need for trained physicians who were also career military officers. The experience of being a doctor in the military encompasses much more than simply practicing medicine. Military doctors must not only be familiar with diseases and injuries foreign to the typical U.S. civilian realm, but also must understand the rigors and processes of the military environment. They must be both physicians and commanders of a medical unit. This added magisterial authority requires that they have training in administration, commanding, etc. This is the goal of the university, summarized by Dr. Dale Smith, professor of first-year military medical history who says, "We're training officers, not just doctors."

Another unique aspect of the USUHS education is its joint services training approach. Graduates of USUHS have fulfilled rigorous training not only in their own branch of service, but have worked closely with classmates of each branch in a variety of training situations. At the end of first-year studies, the students, regard-

USUHS photo

Opposite page: **Uniformed Services University of the Health Sciences. *Left:* In a field exercise, students load a "casualty" for medevac. *Below:* The curriculum stresses physical fitness. This physician-in-training rappels down a classroom building wall.**

USUHS photo by Cindy Hodin

less of service, participate in Operation Kerkesner, a 10-day field exercise held at Quantico, VA, in which they learn and apply training in field skills, medical skills, and unit leadership. Only following this joint course do they break up into service branches for 4 weeks with their line unit or a specialized skills school such as airborne, air assault, or jungle/combat survival. In this way, a type of interservice network is established at USUHS that will serve these physicians throughout their military careers. According to Smith, "the simple fact of knowing officers in other services makes the joint system work."

This team approach not only prepares students to confront a wider scope of practice, but also enhances the overall effectiveness of military medicine. An Army doctor, for example, is able to provide competent treatment on land for the specific burn wounds incurred in a fleet battle. Thus, each branch of service is not its own isolated system, but a joint medical unit that achieves the real goal of military medicine—keeping its members healthy and able to serve in the line of duty.

Students at USUHS are much like any other medical students; they can be seen socializing or holding small impromptu music performances in the quad, studying long hours in the

These students are enjoying their time in one of USUHS's many labs.

President Zimble Takes the Helm

Dr. James A. Zimble retired from his position as Surgeon General of the Navy in June 1991 and enjoyed less than a month of retirement before starting his civilian career as President of the Uniformed Services University of the Health Sciences (USUHS). After his first year, Dr. Zimble is bullish about the institution's mission and programs. Lacking none of the enthusiastic energy that he exhibited when he was Surgeon General, he now tackles the challenge of securing USUHS as a permanent and indispensable facility within the Federal Government.

In his customary ebullient and candid manner, Dr. Zimble describes the university—its achievements, purpose, goals, and growth. He proudly relates the major strides the university has taken in the past year in internal review, organization, and direction.

During his 14 months as president, he has implemented the CQI (continuous quality improvement) process, established an executive steering committee and self-study subcommittees, and is busy preparing for the upcoming surveys by the LCME (Liaison Committee for Medical Education) and the Committee for Higher Education of the Middle States Association. Under his direction, the university has written a new mission and vision statement, enhanced its personnel shop, and tackled the list of deficiencies identified by DOD and OPM surveys.

Perhaps the most controversial "deficiency" of the university was its cost to the Federal Government. Congress questioned the usefulness of having a separate military medical school when the same students could be sent on military scholarships to civilian medical schools at less cost to the government. This criticism, as well as others, led to a recommendation by Congress that the university be closed by 1997. Even more recently, there has been agitation to rename the school as the "National Medical School" and concentrate on the public health field. How does Zimble respond to this debate? He asserts that the institution is ultimately cost-effective and practical when all aspects of the education process are compared.

"The defense of USUHS has been strictly on a cost basis. Critics are only looking at a small part of USUHS. All sorts of elements in the USUHS curriculum build a physician who is more geared to operate within the military structure both in attitude, knowledge, and experience. We produce a military officer who is a physician and that is unique among the 126 medical schools in this country. Does that add value? We think so."

Another issue that commands Zimble's seemingly inexhaustible attention is development and endowment funds. The all-too-familiar cutbacks necessitate the creative pursuit of monetary support for the university. Zimble con-

USUHS photo

The litter obstacle course at Quantico Marine Base teaches teamwork.

library, and huddling over microscopes. Upon closer look, however, one can see the uniforms of every service branch sitting side by side in lecture halls, repelling exercises from the roof of one of the main academic buildings, or PT exercises in the quad. They hail from all areas of the country as well as a variety of ethnic backgrounds. The class of 1991, 163 members selected from an applicant pool of 2,326, consisted of 38 women and 125 men, 19 representing minority groups. The average age of matriculants was 23.7 years and 55 percent had previous military experience.

The students study a typical 4-year medical curriculum, a 1-year rotating/transitional internship in a specialty field of their choice, and normally 2 or more years of additional postgraduate education in a medical specialty. Following these 8 years of study, the student must serve a payback time of 7 years active duty plus 6 years of inactive Individual Ready Reserve (IRR). Thus, the total number of years of USUHS training and obligatory service is 15, 11 of which are creditable toward retirement.

The *Uniformed Services University F. Edward Hébert School of Medicine* fronts this challenge with his customary gusto. "It's an embarrassment to look at the endowment of this university," he laments. "We are capable of having endowment funds through the Henry M. Jackson fund for the advancement of military medicine but they are extremely low." His solution is to enhance the visibility of the school in order to "find people who recognize its value and are willing to make significant contributions."

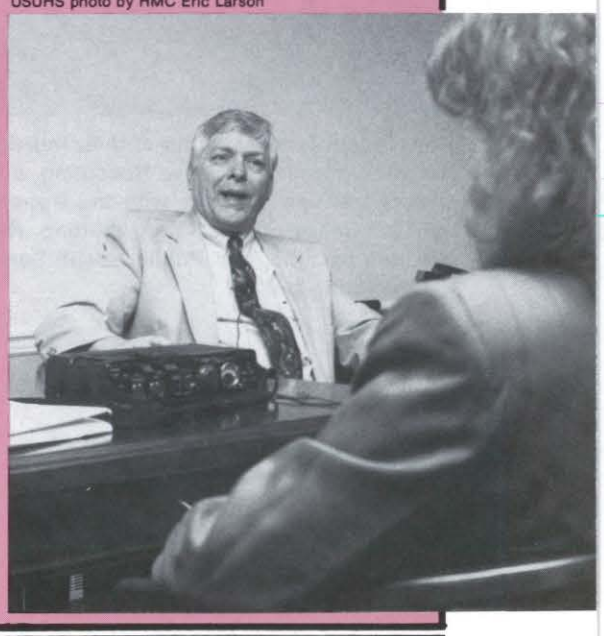
With increased visibility and support, growth will hopefully come in other areas as well, such as the graduate program and continuing education for both military and allied health sciences. Of the graduate program, Zimble says, "We have a fine graduate program which is within the school of medicine, but I would like to see us broaden our scope . . . I'd like to continue to expand and become a more integral part of a continuum of medical education not just for physicians but for allied health sciences and nurses as well."

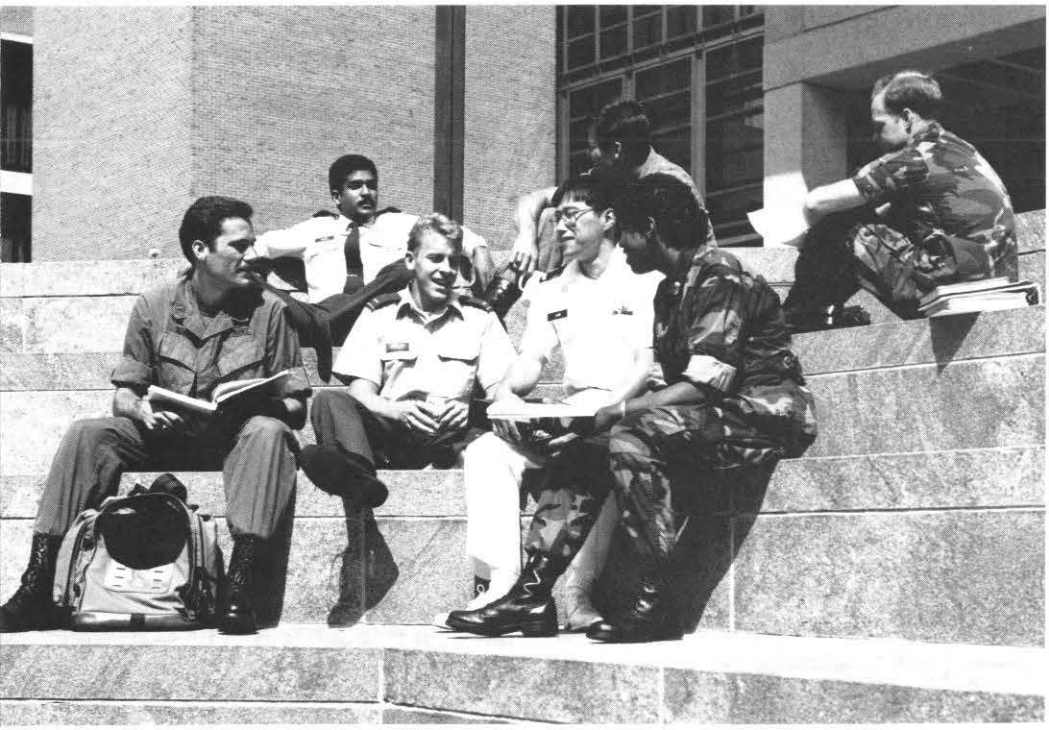
Zimble stresses the importance of research to a good graduate program: "We're very excited that we're doing some first-rate medical research here. It is because of the opportunity to do good research that we are able to attract the superb faculty we have. It is these graduate programs that nurture this kind of faculty." The school receives a significant number of grants from NIH (National Institutes of Health) and the National Science Foundation, and currently has 7 patents with 15 additional pending.

Zimble not only combats these monumental issues on the administrative level, he also finds time to work with the students on a more personal level in the classroom as occasional guest-lecturer. "They are a superb group of students," he boasts. "The best part of this job is being able to mingle, listen to, and talk with our medical students. They are a wonderful group of individuals who have high ideals and have come here recognizing they have a commitment to serve the nation."

When asked what plans he has for the future of USUHS, Zimble asserts that "this school should be the academic keystone for health sciences in the Federal Government." He says, "I'm not involved in immediate plans. I look at strategic plans. I look at a vision; I want to see where we're going to be in the year 2020." With a glint in his eye he can't resist adding, "That's what I call 20/20 vision."

USUHS photo by HMC Eric Larson





USUHS photo by MSGT James Coker, USAF

Bulletin 1992-93 states that the School of Medicine's 4-year program is "aimed at developing students into competent, compassionate uniformed services physicians, creating and fostering an environment of learning and investigative curiosity and providing the setting for the development of uniformed services medical professionalism." The 4-year curriculum is divided into the standard block-system with a concentration on basic sciences during the first year and a combination of basic and clinical sciences during the second year. The third-year curriculum consists of six clerkships done over an eight-block period. The fourth year consists of a series of 10 clerk-

USUHS photo by Christopher Crispo

Top: **Students in uniforms of their individual services relax between classes.** ***Above:*** **Becoming a military physician means learning to move with the troops in the field. Here students learn practical map reading.** ***Right:*** **For her family practice rotation, this Public Health Service student examines a young patient.**

ships, 2 of which are military contingency medicine and military emergency medicine. Upon the completion of the fourth year, the student has achieved a doctor of medicine degree and can then apply for an internship in either a specialty area or a rotational transition internship.

The graduate program at USUHS offers master's degrees in three medical disciplines and doctoral degrees in nine. It differs from the medical program in that it is open to qualified civilians as well as active duty uniformed services personnel. Since USUHS is a tuition-free institution, these graduate civilian students incur neither fee nor payback service time. The cost of their education is comparable to the scholarships offered by other graduate institutions in the Washington, DC area. Full-time graduate students are teaching/research assistants and thus participate in the educational and research aspects necessary to the entire school.

USUHS does more than teach military medicine, however. It provides important programs and builds bridges between many branches of the Federal Government. CONTOMS (Counter Narcotics Tactical Operations Medical Support), a program offered since 1990, has already helped to establish a good relationship with other federal agencies. It is a 2-week course offered to agency employees of the Park Police, Treasury Department, Secret Service, FBI, Federal Marshals, and local police departments. In this unique course, units train in drug intervention, resuscitation, stabilization, various terrains, and dangers of working around certain drug manufacturing areas. These are skills that these agencies may not have either the capability or facilities to teach, so USUHS fills that need and sends these professionals back to their jobs better prepared to support their units when they're called into one of these types of conflict.

USUHS is a unique institution, offering a comprehensive medical education, the specialized instruction necessary to become a military officer, graduate study and research, and key services for other departments of the Federal Government. As the only university of its kind in the United States, it forms a vital link between government agencies and provides the armed services and Public Health Service with trained military physicians ready to serve in emergency disaster situations, peace-time hospitals, and in support of the combat forces. □

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USUHS photo by Carleton Burr

Professor of pathology Dr. Esther Chang (center) and graduate students examine autoradiographs.

Navy Medicine September-October 1942

Jennifer Mitchum

The struggle for control of Guadalcanal would play a central role in the war in the Pacific. U.S. forces had landed there virtually unopposed in August as part of a plan to halt Japanese expansion in the Pacific. Shortly thereafter, Japanese sent reinforcements to Guadalcanal in an attempt to isolate U.S. ground forces and cut them off from reinforcement and supplies. Night landings by the "Tokyo Express" increased and U.S. forces were engaged in heavy battles both ashore and at sea.

At Raider's Ridge on 13-14 Sept, marines, supported by heavy artillery fire, halted waves of enemy troops who were attempting to break through to Henderson Field. Then, in the Battle of Cape Esperance the night of 11-12 Oct, U.S. forces were successful in throwing back a force of enemy cruisers and destroyers as only one destroyer of the enemy's five-ship force escaped damage. Three enemy destroyers and one cruiser were sunk. U.S. damages were comparatively light with two cruisers and one destroyer damaged and one destroyer sunk. Despite heavy losses, the Japanese returned and shelled Henderson Field and by 16 Oct, a convoy of six transports had reached Guadalcanal.

On 26 Oct, the Battle of Santa Cruz began as a carrier task force under RADM Thomas C. Kinkaid and RADM George D. Murray encountered a numerically superior Japanese force. Although American forces were successful in checking enemy movement toward Guadalcanal, it was costly as *Enterprise, South Dakota, San Juan,* and *Smith* were all hit and *Hornet* and *Porter* lost. Comparatively, no enemy ships were sunk and only one Japanese cruiser was damaged.(*1*)

Navy medical personnel had their work cut out for them as casualties mounted from these battles and patrols as well as from frequent enemy shelling and aerial attacks. Corpsmen, accompanying combat troops and patrols, provided emergency treatment and dressing. In addition to corpsmen, at least one medical officer accompanied patrols comprised of more than two companies.

As transportation came ashore, jeeps instead of ambulances were sent to pick up wounded in battle zones because of their size, low-center of gravity, and ability to travel in difficult terrain. The standard jeep with slight alterations could carry three or four stretcher cases and one sitting case. However, jeeps were not always available and oftentimes personnel had to carry wounded long distances on stretchers.

On 18 Sept, reinforcement for the 1st Division, 7th Marines, arrived bringing with them the first full food rations since the initial landings and a "completely equipped medical company."(*2*) Despite naval gunfire their first night ashore, the medical company was able to set up a tent hospital west of the Lunga River and be in operation within 48 hours.(*3*)

Disease: Still Enemy Number One

Although U.S. forces ashore and at sea came under fierce enemy attack, tropical diseases, heat, filth, and flies caused more casualties than actual battles as more were hospitalized due to disease than to wounds. Sunburn and heat exhaustion resulted as the defense line expanded into the hot, shadeless ridges 1-3 miles from the shore lines. Medical personnel issued salt tablets to replace salt lost through body perspiration, and water in 5-gallon cans was carried to the front lines to combat heat exhaustion.

Catarrhal fever, dengue, and malaria were the major medical problems. Malaria was by far the worst offender. It appeared 2 weeks after the initial landings in August. By the end of August, 22 First Marine Division patients had been hospitalized for malaria as compared to 900 on the sick list for other diseases.(*4*) In September, 239 had been admitted for malaria and 1,724 for other diseases. By October, the number of patients hospitalized for malaria was almost three-fourths the number of patients that had been admitted for other diseases with 1,941 on the sick list with malaria and 2,630 with other diseases.(*5*)

LCDR James J. Sapero, MC, commanding officer, malaria control unit, South Pacific, credited the high incidence of malaria to troops landing in the area with "the highest malarial infected mosquito rate in the world"(*6*) and to mistakes made early on after landing. "This landing under combat was followed by a repetition of many of the same mistakes which were made in the first landings on malarious islands under noncombatant conditions. The situation from a malaria standpoint theatened to become a critical factor in the success of the operation. The military situation at Guadalcanal was saved by the use of Atabrine," he said.(*7*)

Medical personnel began using Atabrine as a suppressive treatment on 10 Sept. Medical personnel were advised to issue each member of the force four tablets per week. Patients who had toxic reactions to Atabrine were given quinine. There were problems with malaria control. Initially, medical personnel, untrained in preventive medicine work, oiled mosquito breeding areas within camps. Later, the malaria control unit, consisting of one medical officer, an entomologist, an engineer, laboratory technicians, and enlisted personnel assumed this task but were unable to oil all necessary areas. In addition, medical personnel had a hard time getting troops to ingest the drug and often medical personnel stood at mess lines to issue the tablets and looked into the mouths of the recipients to ensure that they swallowed them.

Because of a lack of hospital beds, many suffering from malaria received treatment in their organizational areas. However, most cases were hospitalized during the acute phase and returned to the hospital for followup treatment. The majority of those admitted to the hospital for malaria returned to duty. Those not fit to return to duty after 10 days or 2 weeks were evacuated by air and sea.

Air Evacuation

Air evacuation of sick and wounded was begun on a large scale during the Guadalcanal campaign.The advance echelon of Marine Air Group (MAG) 25, consisting of 14 R4-D2 aircraft, arrived in the South Pacific on 1 Sept.(*8*) Planes could accommodate 18 stretchers but usually carried 10 because of space occupied by auxiliary gas tanks needed on long trips over water.(*9*) On 3 Sept, they flew into the combat zone and regular evacuation of casualties by air began. Prior to this, only a few isolated cases had been evacuated via combat planes.

Patients were usually loaded under a blanket of darkness and enemy shelling and bombing. During the first 6 weeks, patients were loaded and flown to their destinations without the supervision of medical personnel. In addition, there were no facilities for handling the patients at unloading terminals. A general order was quickly issued by the wing commander requiring that (a) receiving medical units establish facilities and assign medical personnel to receive the patients at the airports, (b) medical officers and hospital corpsmen accompany patients aboard flights whenever possible, and (c) receiving medical facilities provide transportation to the receiving hospitals.(*10*)

By 18 Sept, 147 patients had been evacuated from Guadalcanal by air and this number was rising steadily.(*11*) However, at this point, evacuation by sea remained the most widely used evacuation method with 701 patients departing by that route.(*12*)

Initially, task force commanders in assault areas and the Commander, Forward Area oversaw air evacuation of combat casualties. In October, Army transports and MAG 25 began making joint operations carrying patients to Sydney, Australia; Auckland, New Zealand; and Espiritu Santo, New Hebrides.

Aviation Medicine

Prior to the national emergency, the Division of Aviation Medicine at the Bureau of Medicine and Surgery (BUMED) consisted of one medical officer and one clerk. Approximately 49 flight surgeons, whose primary responsibility was to determine the

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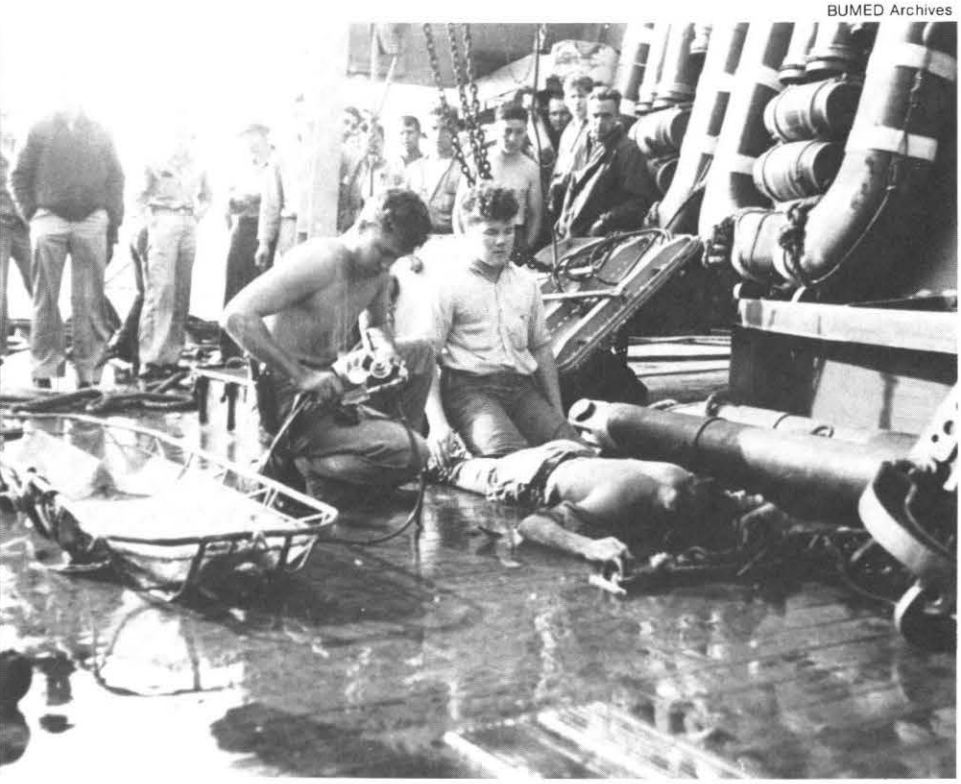
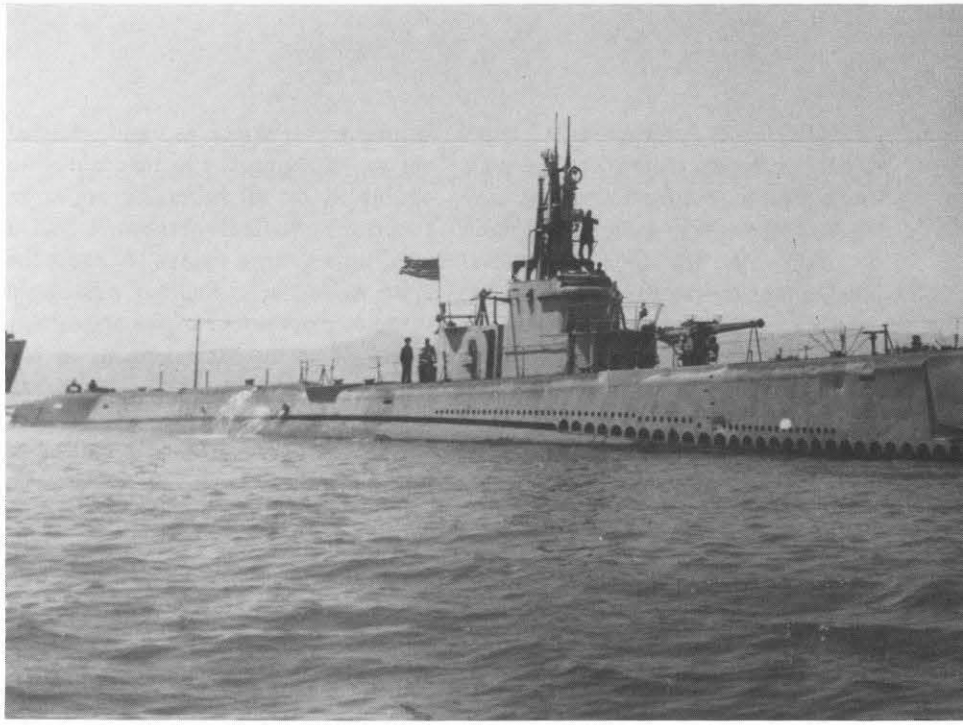


A corpsman, overcome by smoke during a fire on board USS *South Dakota* (BB-57), is about to receive emergency oxygen.

The first emergency appendectomy ever performed on a U.S. submarine took place on USS *Seadragon* (SS-194).



U.S. Naval Institute

physical qualifications for flying of personnel, were on duty with aviation commands ashore and afloat. At that time, flight surgeons received training at the Army School at Randolph Field, TX, because there were no Navy training facilities at which to train them. In addition, there were no funds or facilities for aviation medicine research nor were flight surgeons engaged in research.

Aviation medicine in the Navy rapidly developed, however, after the national emergency. Beginning in 1938-39, the number of flight surgeons progressively increased. In addition, some flight surgeons were assigned flight duty and the Bureau of Aeronautics (BuAer) granted permission for four flight surgeons to receive flight training each year and to be designated as naval aviators. On 29 Nov 1939, a Navy flight surgeon school was established at the Naval Air Station, Pensacola, FL.(*13*) In July 1942, authority was obtained for an insignia for flight surgeons and the "wings" were added to the official uniform regulations. Also that year, a Division of Medical Research was established at BUMED to "direct all aspects of a broad medical research program."(*14*) The Aviation Medical Research section of BuAer was incorporated into the new research division. A flight surgeon was then assigned to BuAer as a technical liaison officer so that information could be more easily exchanged between BuAer and the aviation medical organization at BUMED. The Division of Aviation Medicine continued to expand its staff at BUMED throughout the war. On 29 Oct 1942, the Surgeon General directed that an Aviation Psychology Branch be established at BUMED as part of the Aviation Medicine Division. This directive transferred to BUMED the functions previously performed in the Medical Research section of BuAer, that of developing and administering psychological tests used in selecting or classifying naval aviation personnel and employing psychologists to administer the tests.

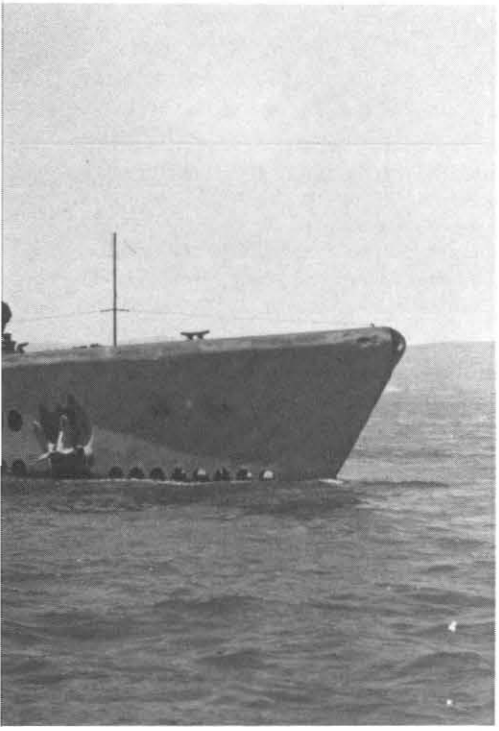
Submarine Medicine

Before World War II, about eight medical officers in the Navy were qualified in submarine medicine. They had been trained primarily in deep-sea diving and were familiar with the construction and operation of a submarine, the problems of submarine escape and salvage, the use of the rescue "bed" and the escape "lung," and the operation of the training tank. With war dawning, facilities of both the Deep-Sea Diving School, Washington, DC, and the Submarine Base, New London, CT, were activated so that more officers could be trained immediately. Hospital Corps personnel were given a course of indoctrination in submarine operation at the Submarine School, New London, CT, before being assigned to submarine duty. Physicians were not assigned to submarine duty.

The most common ailments plaguing submarine crews were injuries, upper respiratory tract infections—"colds," sore throat, catarrhal fever, tonsillitis—and diseases associated with the digestive system—gastroenteritis and chronic constipation. Occasionally, acute appendicitis flared up. Urogenital and skin diseases were also present but infrequent.

Of these ailments, appendicitis posed a unique problem for submarine personnel. Hospital corpsmen assigned to submarines were instructed not to perform surgery but in some cases the circumstances seemed to warrant it. One classic story is that of PhM1c Wheeler B. Lipes who, while assigned to USS *Seadragon,* became the first pharmacist's mate to perform a major operation aboard a submerged submarine on war patrol.

On 8 Sept, PhM1c Lipes found a young shipmate in the crew's compartment of the submarine. The patient complained of abdominal pain, particularly in the right lower quadrant. After 3 days observation, Lipes diagnosed his condition as acute appendicitis and recommended to the commanding officer that surgery was indicated. Lipes used rudimentary equipment to perform the operation such as the wardroom mess table, five tablespoons with handles bent back as retractors, commercially sterilized "handy pads" enclosed in tissue paper envelopes for gauze sponges, and a large tea strainer covered with gauze for a mask in which ether could be dripped. The surgery was a success and the patient fully recovered. The suc-



BUMED Archives

Base personnel at Havannah Harbor, Efate, New Hebrides, receive treatment at morning sick call.

cessful surgery performed under the trying circumstances was not universally acclaimed, however. There was strong opposition at BUMED to corpsmen performing such surgeries especially after two other submarine corpsmen attempted to duplicate Lipes' success. The practice was then officially forbidden.

Other Developments in the Pacific

Like Navy medical personnel in combat areas, those elsewhere in the Pacific also demonstrated excellence and dedication to saving lives and to providing the best possible care. USS *Solace,* serving as a station hospital ship at Efate, New Hebrides, in September, shuttled back and forth between combat zones and mobile and base hospitals. On 3 Oct, *Solace* sailed for Auckland, New Zealand, to pick up casualties. On 22 Oct, she then sailed for the west coast of the United States via Pearl Harbor.

Casualties from Guadalcanal were admitted to Base Hospital No. 2, Efate, New Hebrides, usually within 36 hours after they were injured. Such speedy delivery was due mainly to most of the patients being brought by air to an airfield 6 miles from the hospital. A Quonset hut for the reception of patients was placed near the landing strip of the airfield and a medical officer supervised the transfer of patients from airplane to ambulance. Base Hospital No. 2 reported difficulties in obtaining and maintaining medical supplies. Thus, hospital staffers faced difficulties in chemoprophylaxis and therapy because of shortages of quinine and Atabrine. Mobile Hospital No. 3 in American Samoa did not receive many battle casualties. Instead, filariasis was the major medical concern.

Cub 1 was now in full operation in Espiritu Santo, New Hebrides. By the time USS *Wasp* was sunk on 15 Sept, Cub 1 had already grown to an orderly row of Quonset huts, and floored, screened tents that would accommodate approximately 600 patients. In addition, it had X-ray machines, a pathological laboratory, a medical store, and three operating theaters. (*15*) All of these were needed to care for *Wasp* survivors and those of other vessels as well as those being flown in from shore combat zones.

Elsewhere

While the war was being waged in the Pacific, Navy medicine continued its program of expansion in CONUS and abroad, commissioning USNH Coco Solo, CZ, and USNH Key West, FL, on 1 Sept and 19 Oct, respectively. Construction had begun on USNH Coco Solo, CZ, a 200-bed hospital, in December 1941 when an Executive order put aside 39½ acres in the Canal Zone for a naval hospital. The site was located along the Trans-Isthmian Highway, adjacent to France Field (Army Air Corps). In addition, Mobile Hospital No. 5 arrived in Noumea in September.

On 27 Oct, the Navy Medical Research Institute, under CAPT William L. Mann, MC, commanding officer; CAPT R.H. Draeger, MC, as executive officer; and Professor A.C. Ivy as director of research, was commissioned as part of the National Naval Medical Center, Bethesda, MD. The research center would function in close

U.S. Marine Corps

The old method of evacuating casualties by sea was soon augmented by air evacuation.

cooperation with other components under the direct command of the medical officer in command of the center, who was RADM C.W.O. Bunker, MC. One of its functions was to "visualize and attempt to solve in advance, problems before emergencies arise." (*16*) Upon commissioning, the scientific staff consisted of 13. The institute was later divided into four departments for research: environmental medicine, naval preventive medicine, equipment research, and dental research.

Worth Mentioning a Second Time

Navy medical personnel involved in the Guadalcanal campaign kept with tradition as they exhibited exceptional service and expertise. In this campaign, as in others, there are many notable stories. One is that of PhM2c Daniel Albert Joy, USNR, whose bravery and extraordinary heroism and courage earned him a citation and the Navy Cross posthumously. In addition, a ship would later bear his name.(*17*) At the height of battle with the enemy on Guadalcanal on 5 Oct, PhM2c Joy, while assigned with combat troops, unhesitatingly braved enemy fire and made his way to the front lines to remove wounded and carry them to safety. He continued this hazardous task until he was killed by Japanese gunfire. Joy had enlisted in the Naval Reserve on 8 Feb 1937.

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Naval Medical Research and Development Command Highlights

• Computer Model to Predict the Onset of Decompression Sickness

Diving medical scientists at the Naval Medical Research Institute, Bethesda, MD, and the Naval Submarine Medical Research Laboratory, Groton, CT, developed and tested a real-time probabilistic-based computer algorithm and operating system that accurately predicts the incidence and time of onset of decompression sickness (the bends) for Navy divers for any nitrogen-oxygen breathing gas mixture. The advanced computer system generates decompression schedules for single dives to a single depth, repetitive dives to a single depth, single multilevel dives, and repetitive multilevel dives. The model can be used to compute tables to suit any level of operational risk from extremely safe sport or training dives to riskier dives where the military stakes are higher. Further development is planned to modify the model for use in a diver's wrist-borne underwater decompression meter. The decompression meter will calculate the risk of the bends every few seconds, using a probability formula into which the relevant factors of the dive are programmed. The process views the whole dive as being composed of many moments of risk that all add up to the total risk. Over the next few months, this computer model will be used to produce the next generation of decompression schedules and procedures for Volume 1 of the *U.S. Navy Diving Manual*. For more information contact CDR P.D. Kent, MC, NMRDC Research Area Manager for Submarine and Diving Medicine, DSN 295-0679 or Commercial 301-295-0679.

• CBPTs in Aviation Training Selection

Computer-based performance tests (CBPTs) developed at the Naval Aerospace Medical Research Laboratory (NAMRL), Pensacola, FL, facilitate the assessment of cognitive and psychomotor skills of potential naval and Marine Corps aviators. Research indicates that the present rate of attrition from primary flight training would be reduced from 10 percent to 6 percent by including CBPTs as an additional screening test. Given that the cost of training a single aviator can range from $800,000 to $1.5 million, the reduced attrition represents a substantial savings to the Navy. Also, CBPTs can predict student success/attrition further along in training than any instrument currently available. Representatives from the Chief of Naval Operations, the Chief of Naval Education and Training, the Chief of Naval Aviation Training, and the Commander, Naval Recruiting Command, reviewed CBPTs to determine the advisability of transition to the Naval Aviation Schools Command. The group carefully examined the background and development of CBPTs and decided the tests will significantly enhance the ability to predict the likelihood that an aviation candidate will successfully complete primary flight training. CBPTs may ultimately prove useful in establishing pipeline assignment guidelines and in identifying weak students with low probabilities of successful advanced flight training completion. By October 1992, 25 computer-based work stations will be installed and made available for field testing at the Naval Aviation Schools Command. For more information contact CDR T. Singer, MSC, NMRDC Research Area Manager for Aviation Medicine and Human Performance, DSN 295-0878 or Commercial 301-295-0878.

• New Strategy for Vaccine Development

Vaccines are the most cost-effective methods to control and prevent infectious diseases. However, in many cases standard technologies have failed to provide safe and effective vaccines for viral threats such as HIV or for malaria where there is increasing antimicrobial resistance of malaria parasites. Researchers in the Immune Cell Biology Program, Naval Medical Research Institute (NMRI), Bethesda, MD, discovered the function of a novel class of receptors on T cells that will lead to the development of a new technique for vaccine production. These studies focus on the ability of growth factors to reconstitute immune function and have provided insight into the development of novel immunosuppressants. The prototype of this new class of receptors is the CD28 molecule that functions by controlling interleukin-2 (IL-2) production by T cells. IL-2 is the principal factor required by T cells for growth. In a recent trial involving rhesus monkeys at NMRI, investigators found that monoclonal antibodies binding the CD28 receptor were able to potentiate responses to tetanus toxoid vaccine. Currently a trial in rhesus monkeys is in progress to determine if CD28 therapy can potentiate a vaccine response to HIV. Other projects underway at NMRI to study the CD28 pathway are designed to test whether this system might be involved in common autoimmune diseases such as diabetes mellitus, and whether CD28 therapy can accelerate the development of the immune and blood forming systems after bone marrow transplantation. For more information contact CDR C.M. Schlagel, MSC, NMRDC Research Area Manager for Infectious Diseases, DSN 295-0881 or Commercial 301-295-0881.

Mechanical Ventilation of Apneic Nerve Agent Casualties

LT John E. Koella, MC, USNR

You are operating in a desert environment against a hostile force that threatens chemical attack. Twenty-five miles from the front, you feel relatively secure sleeping inside your aid station at a small logistics base. At 0400 you awake to cries of "Gas!" An enemy aircraft, taking advantage of the early morning stable atmosphere, delivers a small quantity of nerve agent with pinpoint accuracy. Donning your MOPP (mission-oriented protective posture) gear, you make a quick assessment; fortunately, no medical personnel have been affected, the amount of agent delivered was small, and only six casualties require care. Four are conscious and are given atropine, 2-PAM, and diazepam, and they stabilize. Two are unconscious and, although you have managed to start IV's and give additional IV atropine, one of these patients is not improving. Postictal, bradycardic, apneic, and in rapidly worsening respiratory distress, the patient needs rapid intervention. Judging that a vapor hazard persists but the liquid hazard inside the tent is negligible, you elect to demask and intubate the patient. You are pleased at your ability to successfully intubate while in full MOPP, but suddenly realize that without the ability to deliver 100 percent oxygen, ventilation with contaminated ambient air will deliver more nerve agent to the patient. Cursing yourself for not obtaining a Jackson-Rees with a reservoir, and for giving up your only oxygen tank to the forward command post aid station, you continue to administer ventilation, suction, atropine, and 2-PAM. But ventilation requires such high inspiratory pressures that the pop-off valve on the AMBU bag (hand-operated resuscitator) releases and ventilation becomes ineffective. Despite your efforts, the patient succumbs to respiratory failure. The four conscious patients recover, and after 72 hours they are returned to duty. The second unconscious patient is stabilized, medevaced, and returns to duty in 3 weeks.

While deployed to the Persian Gulf with 2nd Battalion, 11th Marines, Regimental Landing Team 5 in support of Operations Desert Shield/Storm, our battalion aid station (BAS) spent many hours training for the treatment of nuclear, biological, and chemical (NBC) warfare agent casualties. One of our most challenging problems was the appropriate triage and therapeutic management of apneic nerve agent casualties that remained in a chemically contaminated environment. With effective treatment, these casualties stand a chance of a relatively rapid recovery with no sequelae after a short period of therapy (*1*) and minimal expenditure of medical resources. This is very different from casualties who have suffered severe trauma from violent forces and who will require intensive therapy, multiple surgeries, a prolonged period of recovery and rehabilitation, and a very large expenditure of medical resources.

The biochemistry of the target enzyme of nerve agents, acetylcholinesterase (ACE) is well understood,(*2*) and effective antidotes and prophylactic pretreatments are available. Only effective ventilation stands between life and death for some nerve agent casualties.(*3*) We devised a field expedient method to provide positive pressure ventilation to the apneic nerve agent casualty while in a contaminated environment; its use will influence triage decisions regarding chemical and conventional casualties.

Nerve agents inhibit ACE by forming a bond which "ages" and becomes irreversible in minutes (agent GD) to hours. With ACE inhibited, acetylcholine (ACH) accumulates, causing severe respiratory compromise and

death by increasing airway secretions, constricting bronchioles, decreasing the stimulus to breath, and paralyzing the muscles of respiration.(*4*) Atropine, a postsynaptic ACH receptor blocker, which is one of the nerve agent antidotes used by the U.S. military, will reverse the muscarinic, parasympathomimetic (autonomic nervous system) effects of the nerve agent, but will not significantly reverse the nicotinic effects (muscle paralysis).

The U.S. military uses pralidoxime chloride (2-PAM) to restore functional ACE, reverse the nicotinic effects of nerve agent, and prevent respiratory paralysis.(*5,6*) A pretreatment, pyridostigmine bromide (nerve agent pretreatment pills (NAPP)), itself a weak nerve agent which reversibly binds with ACE,(*7*) is used to protect ACE from irreversibly binding nerve agent;(*8*) it slows the degradation of ACE by the nerve agent, and allows more time for 2-PAM to scavenge nerve agent molecules. Since pyridostigmine does not cross the blood brain barrier it causes no reduction in mental acuity,(*9*) making it ideally suited as a pretreatment.

Pyridostigmine does not protect the central nervous system (CNS), thus a nerve agent casualty who has taken NAPP may survive the physiological effects of the nerve agent, but will suffer potentially brain damaging seizures. Intramuscular (IM) diazepam is used in the field in serious nerve agent exposures to inhibit the seizure activity and protect the brain.(*10*)

Photos by the author

Adapted AMBU bag

Most nerve agents (GA, GB, GD, GF) are volatile, tasteless, colorless to dark yellow or brown liquids that smell slightly of paint.(*11*) Agent VX is an oily, relatively nonvolatile, very potent agent with rapid percutaneous absorption. The liquids and vapors of nerve agents easily penetrate clothing, leather, wood, latex, and skin.(*12*) They are relatively nonpersistent, depending on wind speed, air temperature, humidity, ultraviolet light intensity, atmospheric stability, and method of delivery.(*13*)

Except for VX, most nerve agents are initially absorbed in the respiratory tract,(*14*) and their onset varies from a few seconds to 10 minutes,(*15*) depending on the agent and the concentration of the inhaled vapors.(*16*) The clinical symptoms persist for 1 day to several weeks, depending on the treatment administered and the amount absorbed.

In a nerve agent attack, some persons will receive significant nerve agent exposure, and will quickly become unconscious and in serious respiratory distress. Without treatment (and subsequent decontamination) many of these persons will asphyxiate. Masking the casualty and giving IM atropine and 2-PAM will increase chances of survival. By taking NAPP, and giving IM diazepam, morbidity and mortality will be further reduced.

It is likely that a significant number of serious nerve agent casualties would recover *only if given IM atropine, IM 2-PAM, and a relatively brief period of positive pressure ventilation with uncontaminated air.* This would allow time for atropine to reverse muscarinic effects of the nerve agent and for 2-PAM to scavenge nerve agent and

Adapted AMBU bag in use

reverse muscle paralysis, and would also provide time for suctioning the airway and decontamination of the patient.

In a contaminated environment these patients would be attended by medical personnel wearing MOPP gear—chemical overgarments, gas mask, hood, boots, and gloves. Since they could not safely unmask, the medical personnel could not provide mouth-to-mouth ventilation. Mechanical ventilation with a hand-operated resuscitator (AMBU bag) will not be useful because even with high flow oxygen it will deliver additional pulmonary doses of nerve agent from the chemically contaminated ambient air.

HM3 Edwin V. Leleux and I developed a field expedient means to deliver filtered, positive pressure ventilation to an NBC casualty in a contaminated environment. By attaching one end of a modified 60 cc syringe to the inlet port of a standard AMBU bag and the other end to the metal exhaust port of a filter from the M17A1 gas mask, filtered air may be delivered with this NBC adapted AMBU bag by medical personnel in MOPP gear. The syringe is modified by cutting off each end to form a hollow plastic tube. Since this tube does not fit perfectly into the filter or onto the AMBU bag input port, several layers of tape must be wrapped onto each end of the cutoff syringe. Also, the oxygen tubing fitting of the AMBU bag must be occluded with a small piece of tape to prevent input of contaminated air if the fitting is not used for oxygen.

Many AMBU bags are designed to prevent pulmonary injury with a "pop-off" valve that releases above certain inspiratory pressures. However, nerve agent casualties may require very high inspiratory pressures until adequately atropinized.(*17*) Thus, AMBU bags for field use should have no pop-off valve, or a valve that can be closed. In planning for medical support of operations with a possible chemical threat, all AMBU bags should be inspected and tested for their ability to deliver high inspiratory pressures.

Monoclonal antibodies against specific nerve agents, scavenger cholinesterase molecules, and more effective nerve agent anticonvulsants hold great promise for more effective treatment and pretreatments in the future.(*18,19*) In view of the proliferation of chemical warfare agents among overtly hostile regimes (*20*) and the evolving treatment modalities for nerve agent casualties, Navy medical personnel must continue training for medical support of operations in a chemically contaminated environment. Thorough training with general triage and treatment strategies is essential for successful management of patients after a chemical weapons attack.(*21*)

Navy medical commands should review our field expedient device, both for function and intent. Certainly our idea can be improved upon, and a more sophisticated means for administering filtered, positive pressure ventilation in a contaminated environment can be developed. Until that time, should NBC warfare occur, the NBC adapted AMBU bag will save the lives of some casualties who require immediate respiratory assistance in a contaminated environment.

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Foodborne Illness in the Military

LT Stephen G. Seifert, MC, USN

Large outbreaks of foodborne illness among military units have been and continue to be a cause of concern for military physicians and preventive medicine personnel alike. Due to the rapidly debilitating effects of these illnesses, foodborne infections can severely compromise the fighting strength of affected personnel, and therefore jeopardize the units' mission and performance. Often inherent in this disease process is the preparation of large meals in a central location, where ideal conditions of food handling and sanitation are not always followed. Such conditions frequently exist aboard ships and with deployed military units. These infections result from the ingestion of pathogenic bacteria, viruses, parasites, or toxins found in contaminated food and water supplies. Despite the presence of foreign organisms within the affected food, the appearance, taste, or odor may remain unaffected.

The incidence of foodborne illness in the United States is difficult to determine because the majority of cases go unnoticed or unreported. However, it has been estimated that as many as 99 million cases of foodborne infection occur per year, at an estimated cost of 23 billion dollars spent on medical expenses and lost productivity.(*1*) Likewise, foodborne illness remains a prominent cause of gastrointestinal disease in the Navy. Within the past 5 years, over 1,000 outbreaks, involving more than 4,350 cases have been reported to the Navy Environmental Health Center, which requires a disease alert report to be filed in all instances of foodborne illness.(*2*)

In addition to the natural incidents of foodborne disease, there exists the potential threat of intentional infection as a means of biological warfare. The possibility of contaminating a unit's food or water supply has been given much consideration lately with the continuing conflict in the Middle East. This contingency has real significance for units depending on the local procurement of their food and water supplies. Furthermore, organisms to which the local population is immune, may be important causes of gastrointestinal disease in nonacclimated American military personnel.(*3*)

Causes

Of all the reported cases of foodborne illness, bacterial agents are by far the most common, accounting for a clear majority of the outbreaks (reported occurrences), and an overwhelming number of the cases (affected individuals) (Table 1).(*4*) Nevertheless, the other causes of foodborne infection are significant for their morbidity, their effect on readiness, and their tendency to go unnoticed or unreported. A presumption of the causative agent in foodborne outbreaks can often be made based on the presenting signs and symptoms of the involved individuals (Table 2). When available, microbiologic studies may be required to con-

TABLE 1

Agent	% Outbreaks	% Cases
Bacterial	66	92
Viral	5	5
Parasites	4	1
Toxins	26	2

firm a diagnosis, but these may take days or weeks to complete.

Treatment

In most cases, treatment must begin prior to a definitive diagnosis. Fortunately, these illnesses are often self-limiting and respond simply to symptomatic care. Various authors have provided recommended formulas for intravenous rehydration fluid, however, D5 NS or lactated Ringer's serve as excellent alternatives which are readily available. The use of antimotility agents is strongly discouraged in most instances, and clearly contraindicated in patients with invasive organisms, due to the possible predisposition to the development of toxic megacolon. The use of antiemetics (IM Tigan or Compazine) is appropriate and supportive in those instances which involve nausea and vomiting. In patients with severe abdominal pain, and where not contraindicated, antispasmodics may also be used for the relief of symptoms. In situations of noninvasive diarrhea, where medical supplies are limited, an alternative to the use of intravenous fluids is enteral rehydration therapy. The effectiveness of this method of fluid replacement has been proven repeatedly during cholera outbreaks over the past 30 years. Formulas for an oral electrolyte solution vary, but should include 20 gm glucose, 3.5 gm NaCl, 2.5 gm NaHCO3, and 1.5 gm KCl per liter of water.(*5*)

The empiric use of antibiotics has long been debated in the medical literature, with various arguments both for and against their use. The indications are somewhat clearer for the military physician, whose additional objective is to maintain a healthy, effective fighting force. Given that appropriate antibiotic therapy may lessen the duration of symptoms and abolish the shedding of infective organisms, it seems wise to begin early empiric therapy if a bacterial pathogen is suspected. This not only allows for a sooner return to duty of affected individuals, but also decreases the number of cases by reducing the infective period.

If a bacterial pathogen is suspected, a reasonable choice for empiric therapy would be trimethoprim/sulfa DS, which is active against most of the common pathogens and is readily available and nontoxic. The newly introduced quinolone agents offer another excellent alternative, and in some cases may be more effective, especially against some strains of shigella or camphylobacter. If cholera is suspected, tetracycline 250 mg qid for 5 days is the therapy of choice. This antibiotic is also useful in the unusual circumstance that Bacillus cereus requires more than symptomatic treatment. Antibiotic therapy for typhoid involves the use of chloramphenicol or ampicillin, depending on the endemic location. Clostridium perfringens and staphylococcal enterotoxin infections are most often self-limiting illnesses and are unaffected by antibiotics. Treatment of botulism involves the use of emetics, cathartics, and penicillin to eliminate the toxin and organisms from the intestinal tract. Respiratory support and the use of antitoxin is used as needed depending on the severity of symptoms.

Parasitic infections are often missed or undiagnosed, and commonly present with chronic, ill-defined symptoms. A high index of suspicion is needed to diagnose both Giardia and trichinosis, as patients will often have a mild illness with only subtle signs and symptoms. They respond well to metronidazole 500 mg tid and thiamabendazole 25 mg/kg bid, respectively.

The production of ciguatoxin and scombrotoxin by certain species of fish, presents another challenge in the diagnosis of foodborne illness. Scombrotoxin initially causes acute gastrointestinal distress, followed by an anaphylactic-type reaction due to excessive amounts of histamine in improperly stored fish. The reaction ranges from mild to severe, and responds readily to epinephrine and antihistamines. Ciguatoxin also produces acute GI distress, but followed by varying neurologic symptoms which may last for weeks to months. This toxin induced illness is due to the accumulation of dinoflagellates in the flesh of affected fish. Treatment of the GI distress is symptomatic, while the neurologic symptoms are known to respond to mannitol, amitriptyline, or antihistamines.

The viral causes of foodborne illness are also difficult to diagnose because of the large numbers of subclinical infections and the general nonspecific symptoms. The treatment for these is strictly symptomatic, yet their detection remains important so as to prevent their further spread.

Outbreak Investigation

Due to the often overwhelming nature of foodborne illness and the transient nature of evidence and individuals, clinical, epidemiologic, and microbiologic investigation of these outbreaks often falls short of ideal scientific standards. This is especially true in military units on deployment, which are separated from sophisticated medical facilities. The investigation, however, is not merely an academic concern, but often of considerable importance in determining the causative and associated factors which led to the outbreak, in order that further infection can be prevented. When possible, a thorough investigation should include:

TABLE 2
Causes of Foodborne Illness

Cause	Onset	Distinguishing Characteristics	Food Usually Involved
Staphylococcal Enterotoxin	2-6 hours	Nausea, vomiting, abdominal cramps, diarrhea, fever—rare, full rapid recovery; lasts 2-12 hours	Cooked meats, milk and egg products, cream-filled pastries
Clostridium Perfringens	6-24 hours, usually 10-12	Primarily diarrhea, abdominal cramps, nausea, vomiting, fever—rare; lasts approximately 24 hours	Meats—particularly beef, gravies
Salmonellosis S. typhimurium S. enteritidis	12-24 hours	Nausea, crampy abdominal pain, fever, watery stools w/o blood or mucus, vomiting—uncommon; lasts 1-4 days	Whole eggs, poultry, turkey, raw meat, dairy products
Shigellosis	1-7 days, usually 2-3	Nausea, vomiting, cramps followed by bloody, mucus laden stools 2-3 days later; lasts 7 days	Dairy products, moist food, contaminated water
E. Coli	1-4 days	Enteroinvasive—bacillary desentary, enterotoxigenic—traveler's diarrhea, enteropathogenic—infantile diarrhea, enterohemorrhagic—hemorrhagic colitis	Fecal—oral route, contaminated foods
Camphylobacter Jujuni	2-4 days	Abdominal cramps, profuse watery diarrhea w/occasional blood, fever, vomiting—rare; lasts 3-5 days	Salads, infected poultry, contaminated water
Vibrio Cholera	8-24 hours	Painless, massive, watery diarrhea followed by vomiting, severe dehydration; lasts 1-7 days	Contaminated water, fecal—oral route, seafood
Typhoid S. typhi	1-3 weeks	Fever, prostration, abdominal pain, rose-colored rash	Dairy products, shellfish, contaminated water
Hepatitis A	10-55 days, usually 30	Often subclinical, fever, nausea, vomiting, malaise X 1 week followed by jaundice	Raw clams, oysters, meat, contaminated water
Norwalk Virus	4-24 hours	Mild nausea, vomiting, abdominal cramps, diarrhea; lasts > 24 hours	Raw clams, oysters, cockles, salad, pastries
C. Botulinum Toxin	12-36 hours	Nausea, vomiting, diarrhea followed by progressive neurologic paralysis, no fever	Home-processed protein foods, honey, inadequately canned foods
Scombroid Toxin	15 min-2 hours	Facial flushing, nausea, vomiting, epigastric pain, urticaria; lasts < 24 hours	Fish: mackeral, tuna, marlin, bonito
Ciguatera Toxin	1-6 hours	Nausea, vomiting, diarrhea, cramps X 6-18 hours followed by pruritis, parasthesias, headache, myalgias	Fish—Florida coast, West Indies: barracuda, grouper, red snapper, amberjack
Trichinosis T. Spiralis	2-28 days, usually 9	Mild GI symptoms followed by periorbital edema, myalgia, fever, eosinophilia	Insufficiently cooked pork
Giardia G. lamblia	3 weeks	Mild, intermittent nausea, diarrhea, abdominal cramps, flatulence	Contaminated water, food handlers, moist food
Bacillus Cereus	2-12 hours	Nausea, abdominal pain, diarrhea, vomiting—rare; lasts 12-24 hours	Fried rice, sauces, meats

(1) Clinical Questionnaire
   a. Symptoms, onset, duration
   b. Vital signs, physical findings, treatment

(2) Epidemiological Questionnaire
   a. What food was eaten, how much, where
   b. Include individuals who ate the suspected food but did not become ill

(3) Microbiological Investigation
   a. Culture of patients' emesis/diarrhea
   b. Culture of suspected food/food handlers
   c. Phage typing/toxin identification (requires CDC)

Sources of assistance and expertise in foodborne investigations include local health agencies, Navy environmental health units, and the Centers for Disease Control, all of which can help confirm a diagnosis and alert other units of possible outbreaks.

Prevention

Epidemiological investigations indicate that over half of all foodborne illness occurs as a result of improper food service sanitation.(*4*) These are clearly preventable occurrences, if rigid adherence to food-handling procedures are followed. It is unquestionably easier to prevent foodborne outbreaks than to treat large numbers of acutely ill patients. The routine inspection of food preparation facilities has been shown to be effective in preventing these outbreaks.(*6*) Additionally, the importance of strict handwashing practices can not be over stressed. Any individual with a communicable disease or with open lesions of the face, neck, arms, or hands should be withdrawn from food handling duties until cleared by a medical officer. Another important consideration involves the time and temperatures of stored food, while it is being prepared or waiting to be served. The general rule of thumb is that no food should be stored for longer than 3 hours if not refrigerated at less than 40° F, or warmed to greater than 140° F.

The occurrence of foodborne illness is clearly an important issue for all those involved in the maintenance of a healthy and effective fighting force. Prevention is clearly the preferable choice, but if detected, the rapid diagnosis and treatment of foodborne outbreaks can minimize lost time and maximize unit readiness.

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Just Received

During the 50th anniversary of World War II, new scholarship on the history of that conflict has produced many new books on subjects never before examined in detail. One such aspect of the war concerns the part New Zealand played in hosting United States forces during the Pacific campaign. To provide medical care for those fighting forces, the Navy Medical Department staffed Base Hospital No. 4 and Mobile Hospital No. 6 in Wellington, and Mobile Hospital No. 4 in Auckland.

A new book, *United States Forces in New Zealand 1942-1945* has just been published and includes new information on these facilities. The book is available through the author, Denys Bevan, 18 Spiers Street, Kakanui, North Otago, New Zealand. The price is $25 (U.S.), which includes handling and postage. Checks are accepted.

Navy Medicine 1944

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